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RALPH BUDD

ENGINEER — WSE MEMBER — CIVIC LEADER

WSE MEETINGS — PAGE TWO

Vol. 2 **OCTOBER, 1949**

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COVER CREDIT

Oil Portrait of Ralph Budd painted by John Doctoroff, eminent portrait painter, to commemorate Mr. Budd's retirement from the Burlington system, and his assumption of a difficult and important civic responsibility as Chairman of the Chicago Transit Authority.

Western Society Activities in October

(Monday night is WSE night at our Headquarters)

Annual Fall Dinner, Oct. 31

The Annual Fall Dinner will be held Monday evening, October 31, in the Grand Ballroom of the Sheraton Hotel.

Col. George Goddard, Chief of the Air Force Photographic Lab at Wright Field, will present unusual new stereoscopic-strip aerial photographs of bomb damage in full color. Special Polaroid glasses enable the audience to see the double-image films.

For full information, please turn to Page 15.

Junior Division, Oct. 13

The first meeting of the Junior Division will feature the subject, "The Business Side of Engineering." Individual notices will be mailed to members of the Junior Division.

Communications, Nov. 7

The Communications Section will present a panel discussion on the subject, "The Engineer Prepares for Management," with five interesting speakers and a moderator. For details, see Page 14.

WSE Calendar for 1949

Monday Night is WSE night at Headquarters.

OCTOBER

October 10	Bridge & Structural Engineering Section
October 17	Chemical & Metallurgical Engineering Section
October 24	To Be Announced
October 31	*Annual Fall Dinner*

NOVEMBER

November 7	Communications Engineering Section
November 14	Civic Committee
November 21	Electrical Engineering Section
November 28	*Joint Meeting*—Hydraulic, Sanitary & Municipal Engineering Section, Traffic Engineering & City Planning Engineering Section

DECEMBER

December 5	Fire Protection & Safety Engineering Section
December 12	Gas, Fuels & Combustion Engineering Section
December 19	Hydraulic, Sanitary & Municipal Engineering Section

Bridge & Structural, Oct. 10

R. W. Binder, Chief Engineer of the Bethlehem Pacific Coast Steel Corporation, will speak before the Bridge and Structural Engineering Section on Monday, October 10, at 7 p.m., in the WSE Headquarters.

His subject will be "Experiences and Theories in Earthquake Forces." Although earthquakes have been occurring since the formation of the earth, a surprisingly small amount of helpful printed material is available to engineers and architects on the subject. The talk will include current thinking and accomplishments in the field.

Mr. Binder is chairman of the Seismology Committee of the Structural Engineers Society of Southern California.

Chemical & Metallurgical, Oct. 17

Dr. Otto Eisenschiml, Chairman of the Board of the Scientific Oil Compounding Company, will speak at a meeting sponsored by the Chemical and Metallurgical Section at the Western Society headquarters on October 17th, at 7 p.m.

He will speak on the subject, "How to Improve the Social Standing of the Engineer." The fact that society is slow and so often fails to recognize and reward the engineer for his countless contributions to the comforts and luxuries of our day, make this meeting a very practical and timely one.

After receiving his Ph.D. degree from the Vienna Polytechnic Institute in 1901, Dr. Eisenschiml worked in steel mills, oil plants, and other industries before organizing the Scientific Oil Compounding Company. He directed the destinies of numerous technical and scientific organizations and gave unstintingly of his time and substance to legislative committees attempting to pass laws abolishing misrepresentation of chemical products.

He was awarded the honorary degree of Doctor of Literature from the Lincoln Memorial University for his outstanding work on Abraham Lincoln. He is internationally known for his ability as a scientist, businessman, historian, and raconteur.

Dr. Eisenschiml sends an invitation to the wives of WSE members to be present at this meeting as he has a message of special interest to give them.

Television Football Huddle

The WSE Football Huddle will be held in the Lounge every Saturday afternoon for the pleasure of members and guests. Football games, via Stewart-Warner television, will start shortly after noon, and will be listed in a forthcoming News Letter. For details, see Page 22.

Ralph Budd Retires—Begins Anew

On September 1, 1949, Ralph Budd retired from his position as president of the Burlington Lines, and assumed the duties of Chairman of the Chicago Transit Board. In taking the position of Chairman, Mr. Budd is extending in a new but related field his already brilliant career in the transportation industry.

Starting with the engineering department of the Chicago Great Western Railroad in 1899, Mr. Budd has been continuously in railroad work. In 1906 he was called by the government from his position with the Chicago Great Western to be chief engineer of the Panama railroad, a key task in the building of the Panama Canal.

In 1919 Mr. Budd was elected president of the Great Northern railway, which position he held until 1932. Since that time he has been president of the Chicago, Burlington & Quincy and its subsidiaries.

During the summer of 1930, Mr. Budd spent three months in Russia making a comprehensive survey of the railroads for the Soviet government.

Under his direction the Great Northern built and electrified its line through the Cascade mountains when the eight mile Cascade tunnel, longest in North America, was built. Under his guidance and inspiration the Burlington pioneered the development and installation of the Zephyr, America's first diesel-powered, lightweight, streamlined train.

Because of his progressive leadership, as well as his outstanding administrative ability, civic leaders, transportation experts, and financial men have all hailed his turning his interest to Chicago's transit problems.

The Chicago Transit Authority is a separate municipal agency established by legislative action. Its lines serve all sections of the city and many adjacent suburban committees, and comprise one of the largest local transportation systems in the world. It has no power to tax, but must support itself and pay for its extensive modernization program out of its fares and operating revenues.

The Chicago Transit Board is the administrative agency of the CTA and sets its policies of operation. The Board consists of seven members, three appointed by the Governor of Illinois and four appointed by the Mayor of Chicago. Ralph Budd was appointed by Mayor Martin H. Kennelly on May 25, 1949, to succeed the late Philip Harrington, who was the Board's first chairman.

In assuming the chairmanship Mr. Budd revealed a great sense of civic responsibility. He stated, "I should like to express my appreciation of this opportunity that has been given me to serve in a public capacity the people of the city where I have lived for nearly 18 years. If I can contribute in any way to the progress and growth of this truly great city and its metropolitan area, I shall be very happy."

However, he holds no illusions in regard to the job which confronts him in dealing with Chicago's transit problems. The Chicago Transit Authority, by city ordinance and state law, is charged with the duty of providing a modern, unified local transit system—at cost. Mr. Budd has pointed out that "neither promises nor forecasts on my part will hasten the attainment of that objective. Results alone will govern. Therefore, I have only a single pledge to make—and it is this: To the job for which I have been chosen, I shall give my best."

Mr. Budd realizes what the public wants—the best transit service it can get, at the lowest possible fares. His methods of attaining this goal are direct. Since the charges made by the CTA reflect actual operating costs he proposes to do everything possible to operate as efficiently as conditions will permit. Mr. Budd has expressed the hope that the CTA's program can be continued and even speeded up because it will bring about lower operating costs, and at the same time better and more comfortable service.

In commenting on some of the criticisms of the CTA's current modernization program, Mr. Budd said, "I realize that some patrons are opposed to aspects of the current modernization program—the elimination of stops, for example—but it should be borne in mind that local transit is a mass service industry, and that the needs of the greatest number must prevail. A reasonable and understanding attitude on the public's part will be of inestimable aid to the management in obtaining what we all desire—the best local transportation for Chicago."

(*Continued on Page* 4)

Ralph Budd Retires

(*Continued from Page* 3)

Among more than twenty-five other members of WSE who are associated with the Chicago Transit Authority are the following:

Charles A. Butts (M'47), Signal Engineer; Heinz G. Doering (A'48), Development Engineer; Arthur U. Gerber (M'20), Architect & Structural Engineer; Robert Grove (S'49), Student Engineer; Erven M. Guy (J'24;A'27-33;'36), Assistant Internal Auditor; Walter S. Helmer (M'46), Specifications Engineer.

Others are Horace L. Howell (M'20), Supt. of Way & Structures Department; Eldon A. Imhoff (M'40), Management Assistant and WSE Trustee; Charles E. Keiser (M'47), Executive Assistant, and member of WSE Civic and Membership Committees and Executive Board of Transportation Section; R. G. Kendall (M'46), Transit Analyst; George Krambles (M'46), Engineer.

J. D. Larkin (A'49), Specifications Engineer; Wm. R. Marston (A'36; M'48), Traffic Engineer, and member of WSE Civic Committee and Executive Committee, Traffic Engineering and City Planning Section; F. J. Misek (Aff'49), Engineering Assistant; George W. Nelson (A'36-38;M'47), Supervisor of Substation Operating Personnel; Thomas B. O'Connor (M'47), Assistant Supt. of Transportation; E. E. Olmstead (A'49), Specifications Engineer.

H. G. Petersen (M'20), Asst. Engr., Structures & Buildings; C. R. Potter (A'35;M'43), Div. Supt. of Track; Lester H. Reichard (J'24;A'29-33;M'47), Asst. Supt. of Shops & Equipment; C. W. Ricker (A'49), Specifications Engineer; John L. Ruzich (M'46), Div. Supt. of Track.

R. J. Shanklin (M'48), Asst. Supt. of Buildings; L. M. Traiser (J'24;A'30; M'47), Staff Engineer; Reginald N. Wade (M'27) Engineer, Maintenance of Way and member of the Executive Committee of WSE Traffic Engineering and City Planning Section; C. Walter Wolf (M'46), Electrical Engineer; Donald H. Worchester (M'46), Assistant Engineer, Signals.

The Women Do, Too ! ! !

Do what?—— Why build your new home or factory; plan and landscape a new housing development; protect them from fire; look after their power, telephone and sanitary requirements. If that isn't enough service, the girls can look after some of the legal, financial and publicity items as well.

Where?—— Why right in Chicago in our own Western Society. The newest group in the Society is the Women's Council.

Just a little over one year old, the Council has eighteen members whose daily activities encompass many phases of community life from architect to home-maker. These women, if they were to pool their technical resources, could lay out and provide most of the necessary services for a modern community, including residence, commercial and industrial areas. This sounds like a large order but a quick survey of the combined professional experience of the members and applicants shows architects capable of designing homes, schools, churches, commercial and industrial buildings; a structural architect for heavy problems; and a city planner and a landscape architect for the basic layout. To take care of the specialties, the roster lists engineers experienced in planning the less romantic sewer and drainage systems and providing suitable water supply to the plumbing equipment available from another member. Such a community, especially the industrial area, would need some heavy duty power equipment and a mechanical engineer to keep things going. Fire protection and fire fighting equipment would not be overlooked. Telephone service for the community would include tailored-to-order special services such as tie lines between commercial units and mileage extensions for the doctors, as well as facilities for regular exchange and toll service. The whole enterprise would benefit from the skill of women qualified in law and business administration as well as in engineering, and from the experience of members expert in cost analysis and the editing of technical reports.

The Women's Council has no such project in mind, but it does have a goal for this year—the increase of its membership to at least 40 so that it can petition the Board of Directors for a Division status in Western Society. This is a higher goal than the "one new member for each existing member" of the Society as a whole but the girls are confident that they can attain it.

The Women's Council holds one meeting a month, on the second Wednesday, to provide an opportunity for discussion of questions of particular interest to women in their professional work. In addition, a short talk, usually by one of the members, provides an interesting and instructive program followed by a lively discussion period.

In the Society as a whole, the women are active workers on the various standing committees, are regular attendants at the general and sectional meetings and are particularly proud of their 82% participation in the building fund.

Western Society members are cordially invited to visit the Women's Council and see first hand what the Society's newest group is doing.

Mary L. Murphy, Chairman
Professional Women's Division

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Industrial Research and Its Relation To Corporation Management

Paul D. V. Manning, Vice President
International Minerals & Chemical Corporation
Chicago, Illinois

One of the important faculties which distinguishes man from the lower forms of animals is his ability to combine curiosity with reasoning. This is essentially the motivation of research. It is man's desire to do a thing differently and especially, more easily. This desire coupled with his pride of authorship, makes each man think of other ways of doing things and then to see advantages in the result of his thinking. Thus, we are really all researchers.

When investigative effort is directed by an established philosophy or policy and directed towards a definite goal, it becomes planned research although it may not necessarily be scientific.

In some of what follows we have borrowed freely from a newly published book, RESEARCH IN INDUSTRY, edited for the Industrial Research Institute by Dr. C. C. Furnas. The best definition of research we have seen is that given by Furnas and is here quoted.

"Research is the observation and study of the laws and phenomena of nature and/or the applications of these findings to new devices, materials or processes, or to the improvement of those which already exist."

Industrial research, that research carried on by industry, connotes to some people, less of the abstract and more of the practical. This, however, is an error in viewpoint. Industrial research differs from more abstract research in that it generally (but not always) starts with a definite pattern aimed at a preconceived end result of direct benefit to the corporation. Naturally, the purpose of industrial research is to further the progress and improve the financial condition of the corporation for which the work is carried on. In other words, it aims to increase profits, either through protection of the corporation from competitors, diversification of the business, or both. These objectives can be broken down into four more detailed classes, as shown in the following table.

Objectives of Industrial Research

1. Products.
   - To discover new products.
   - To perfect and improve presently made products.
   - To find new uses for present products.
   - To develop uses for wastes and by-products.
2. Processes.
   - To discover new processes for making present or new products.
   - To discover means of lowering costs of processes.
   - To aid in overcoming processing troubles.
   - To aid engineering and operations in design, building, maintenance and setting up of standards.
3. Raw Materials.
   - To find new raw materials and new sources of those already in use.
   - To improve and standardize raw materials.
4. Business Protection.
   - To develop a patent structure for the corporation.
   - To find ways of preventing or abating the nuisances of air and stream pollution.
   - To aid in protection of employees from industrial hazards.
   - To aid in sales development and customer relations.
   - To aid public relations.

It is impossible to set up a fixed schedule for the emphasis of the foregoing objectives which will apply to all enterprises. Moreover, if it were possible, it would be undesirable, since it would tend to freeze as static, something which is and should be dynamic and constantly changing. The points of emphasis depend upon the needs of the corporation and these are in a continuous state of flux.

Assuming, however, that the producing divisions of a corporation have provided means whereby plant operations may be kept at top efficiency, then at least a few of the items on the list may be emphasized by research.

Having an aggressive, progressive top management, a corporation may well allocate about half of its research emphasis to fundamental or abstract research. This type of research is required to secure new facts upon which the future research can be based. A better understanding of the importance and application of strictly fundamental research can be drawn from many ex-

(*Continued on Page 6*)

Industrial Research

(*Continued from Page* 5)

amples of successful researches which have been completed during recent years.

First, all of the basic facts needed for the making of the atomic bomb and production of atomic energy were known long before the bomb was successfully produced—these facts were the products of fundamental research and after discovery stayed practically unused for years.

A second example is the fundamental work which Kettering and his co-workers carried out in the development of tetra-ethyl lead as an anti-knock agent.

Cooperative Endeavor

Industrial research is a cooperative endeavor. The discoveries made solely by one industrial research worker are very few indeed. On the other hand, discoveries due to research of the most fundamental character in a single field are often made by lone workers.

Results from the greater part of industrial research come from the efforts of research teams, and the speed with which modern research teams get results is due primarily to the fact that the work is done by such groups of specialists. The known facts and laws of chemistry, physics, mathematics, biology and engineering have become exceedingly numerous, diverse and complex. No matter what the objective of an industrial research project may be, the investigation usually involves all of these fields. The success of industrial research, therefore, depends on the work of groups of specialists, each member bringing to bear on the problem the viewpoint and ideas arising from the application of his specialized knowledge to the problem at hand.

Since successful research requires this coordination of the concentrated efforts of members of research teams, it can best be carried out in a central research laboratory. Such a laboratory should be located in pleasant surroundings and at a place where diverting influences can be minimized. The term "pleasant surroundings" is a broad one and should be interpreted to include comfortable living conditions.

The best research men are seldom entirely actuated by a desire for money. Proper recognition of effort is, of course, a must. But scientists are most interested in a way of living and working which meets their standard of ideals. What is highly prized by research men is the opportunity to contribute some knowledge and discoveries to the ever growing reservoirs of known laws and facts of nature, and to help in turning the knowledge thus discovered into useful service to mankind, thereby bringing recognition of their efforts. To do this best, they must be allowed to work in good surroundings and be as free as possible from influences which tend to divert their concentration from their work. Later in life increasing income becomes a great incentive to improve and maintain a proper standard of living for family life and provide for security in old age.

For the foregoing reasons, modern industrial research laboratories are being built in the country, near cities but not in them; near universities but preferably not on the campuses; near executive offices but not in the same buildings. Adherence to these fundamental principles makes possible a number of other desirable features. These include the opportunity for contact with scientists in the vicinity, attendance at more scientific meetings, pursuance of advanced study at universities, etc.

Specifications for Lab

From a material standpoint the specifications which the ideal research laboratory should meet are as follows:

1. Pleasant and quiet surroundings which can be kept beautiful, giving the needed type of "atmosphere."
2. Accessibility to a fine but reasonable cost residence district of smaller size.
3. Adequate supplies of water, gas and electricity.
4. Adequate sewage disposal.
5. Freedom from dirt, noise and vibration.
6. Freedom from conflicting interests with production and operations.
7. Adequate provision for normal growth.
8. A building designed and built especially for research and the job it must do.

Such specifications remove the research laboratory from the vicinity of the producing plant and this also is best for the research worker. It obviates the tendency of making research subservient to production. The purpose of a production unit is to manufacture products, and at the location of such a unit it is only right that all efforts be coordinated to the end desired. On the other hand, research is a long range operation and requires firm adherence to methods of science and tools of scientific study. It is not a trouble-shooting expedition. Its objective is to anticipate growth of the corporation and to direct that growth in profitable and permanent activity.

Even though the general goal of all corporate activity including both production and research, is to produce a profit for the corporation, *the immediate means by which these ends are attained, are different.* In other words, each has a different job to do—a different part to play in the attainment of the same ultimate goal. The production manager is therefore not the proper person to direct the research or to make the decisions as to what research projects should be carried out. The same is true in respect to the sales manager. He also has his own job to do. Ordinarily a sales manager is not asked to manage production. Nor is a production manager held responsible for sales. Neither should have the responsibility for research.

The production manager has a real interest in that part of the research functions which may affect his immediate production. The same is true with the research director. In other words, there is a graduation of interest from the intense or major one to the shaded or fringe area which is of joint concern to both production and research. This brings us to the subject of development. There is no real difference between research and development. Webster defines development as "The disclosing of that which is unknown; a gradual unfolding or a gradual advance or growth through progressive change." We submit that this is an equally good definition of research. Furnas speaks of development as "A period of adolescence in industrial research—the project grows up." In our opinion, it is the common meeting ground—the focal point of interest for both research and production. In other words, it lies between research and production.

(*Continued on Page* 25)

New Standards For Drawings

The language of graphical symbols is being enlarged and revised, giving architects, engineers, and contractors an improved method of specifications. In the compilation and development of these standards, simplification and clarification was the aim—to produce what industry will find most helpful in the way of Graphical Symbols.

This article, which appeared in Standardization, the news magazine of the American Standards Association, Inc., was written by William J. Kunz, vice-chairman of the ASA Sectional Committee on the Standardization of Graphical Symbols & Abbreviations for Use on Drawings. He is manager of drafting of Combustion Engineering-Superheater Inc.

As the engineering requirements of American industries have increased, particularly in the period during and since the war, it has been necessary to enlarge and revise the language of graphical symbols. In consideration of these requirements the ASA Sectional Committee on the Standardization of Graphical Symbols and Abbreviations for Use on Drawings, sponsored by the American Institute of Electrical Engineers and the American Society of Mechanical Engineers, has been engaged in developing, enlarging, or revising, when necessary, the American Standards for graphical symbols.

Some of the most active work has been the standardization of symbols for use in mechanical engineering. The standards which will be made available as a result of this work are now divided into six groups—plumbing; pipe fittings, valves, and piping; heating, ventilating, and air-conditioning; railroad equipment; heat-power apparatus; and welding.

This sectionalization into six different classifications was made so that industries can make use of the section which pertains to their problems without having to accept the other sections which are of no interest to them.

The American Standard Graphical Symbols for Plumbing gives architects, engineers, and plumbing contractors a standard method of indication for plumbing fixtures and allied items. The 69 symbols listed are nationally recognized in the plumbing field and are presented as the present day minimum requirement. To ensure the clarity of these symbols, letters identifying them are used only to distinguish various items of equipment in order to define their application.

The American Standard Graphical Symbols for Pipe Fittings, Valves, and Piping, contains an enlarged list of 71 symbols which has been brought up to date to contain the symbol required by present day industry. Because in the field of piping there are many existing symbols that are not presented here, the 71 symbols are shown as a minimum list. Other piping symbols were not presented because it seemed impossible to get a consensus at the time this standard was revised. In the case of various fields where practices vary to a great extent no uniformity can as yet be established.

The American Standard Graphical Symbols for Heating, Ventilating, and Air-Conditioning has been expanded to meet the ever growing requirements of all of the industries of these fields. This standard includes 81 symbols as a minimum requirement. Its air-conditioning symbols were coordinated with the compilation made by the ASA Sectional Committee on Refrigeration Nomenclature.

To be issued for the first time is an American Standard Graphical Symbols for Railroad Equipment, which has been compiled from approved and accepted lists contained in the standards of the Association of American Railroads.

A proposed American Standard Graphical Symbols for Heat-Power Apparatus, contains 44 symbols as the minimum list. There are several symbols in the field of heat-power equipment which are not presented in this standard because they do not seem to have national acceptance at this time. In spite of omissions, this standard has been considerably expanded over the previous issue and is suited to the whole industry.

The American Standard Welding Symbols and Instructions for Their Use, covers nationally recognized symbols for the welding field. These were adopted as a standard of the American Welding Society before approval as an American Standard under ASA procedure.

In the compilation and development of these standards an attempt was made to simplify and clarify the symbols themselves as well as their classifications. Eliminated were the two different weight lines, heavy and light, which were used in drawing the symbols in the 1941 version of the standards. Now one weight line which is neither heavy nor light has been adopted. These revisions were made to save drafting time.

In the new classification, the symbols are arranged alphabetically with heads for major divisions.

Since the aim of each standard is simplification, the title of each standard has also been made clearer.

Much work still remains to be done in the standardization of graphical symbols for other industries. The subgroup needed for work on mechanical gage and instrument symbols has not yet been organized, and various subcommittees that have been organized have not started work. When the specific industries indicate a demand for graphical symbols in their fields the subgroup on automotive industry symbols, aeronautic industry symbols, machine tool symbols, processing industry symbols, structural steel symbols, marine symbols, and bolt, nut, and rivet symbols will begin work.

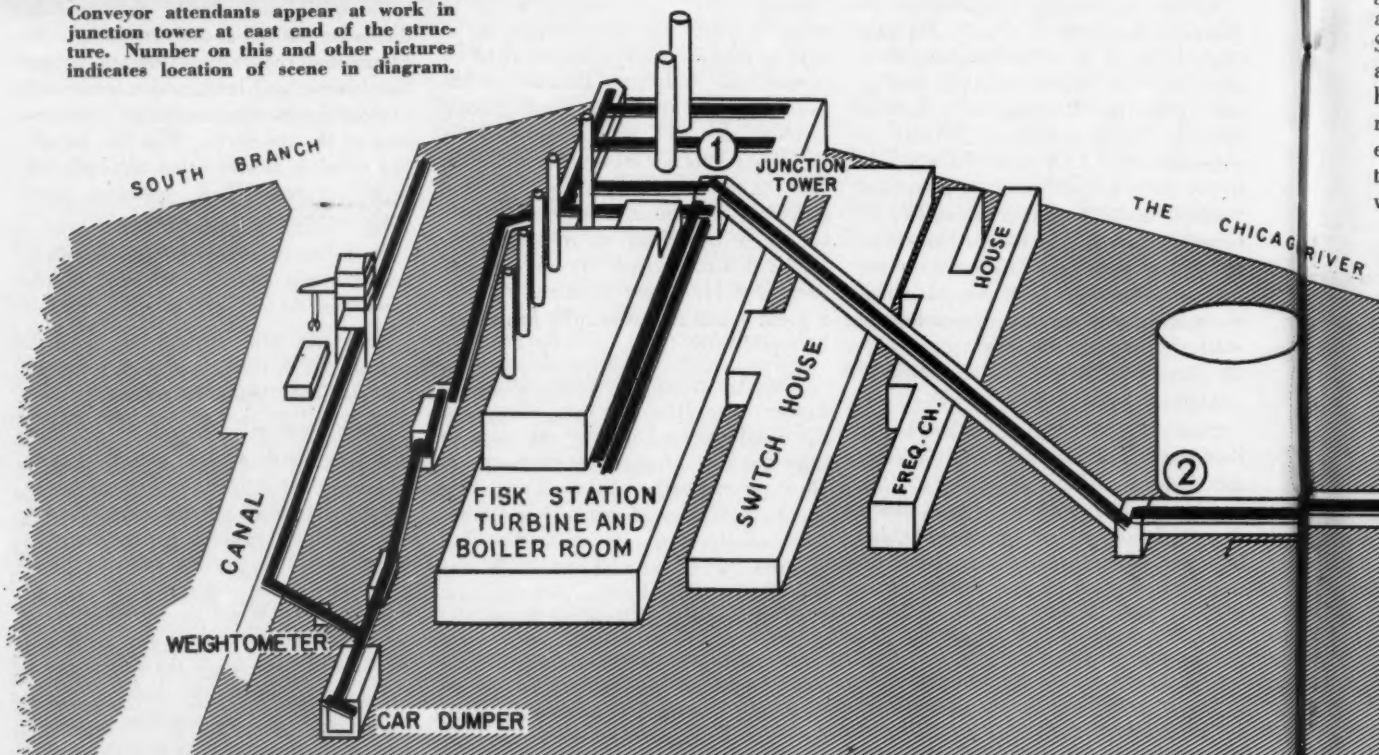
Some work, however, is in progress at this time. A survey is being made of industries concerned with mechanical gage and instrument symbols and with processing industry symbols to find out what symbols in these fields are in use nationally so that standards can be established.

It is hoped that as time goes on the work already accomplished in the establishment of graphical symbols, and the work that will be done, will result in a comprehensive collection of standards for every industry in the United States which uses symbols.

Chicago's New Coal Shovel — Three-eighths of a Mile Long!

Late in July the new conveyor system which links Fisk Station of Commonwealth Edison Company directly to the Loomis Coal Handling Plant (between points 1 and 5 on the diagram) was placed in service. Heretofore, the coal was delivered to Loomis and the screened larger sizes stored there until required. When needed it was again loaded on barges and transported to Fisk via Mason's Canal (at left on diagram).

Conveyor attendants appear at work in junction tower at east end of the structure. Number on this and other pictures indicates location of scene in diagram.



Load is transferred at junction point from one belt to another.

A view inside the conveyor structure looking toward the Loomis end. A future conveyor may be built in the space at right. The structure is 18 feet in width.

It is now possible to supply the station bunkers from the two sources. The new conveyor will be used as the main supply with the old system as an alternate, guaranteeing an uninterrupted flow of fuel if either system fails. Conversely, they can be operated simultaneously if necessary.

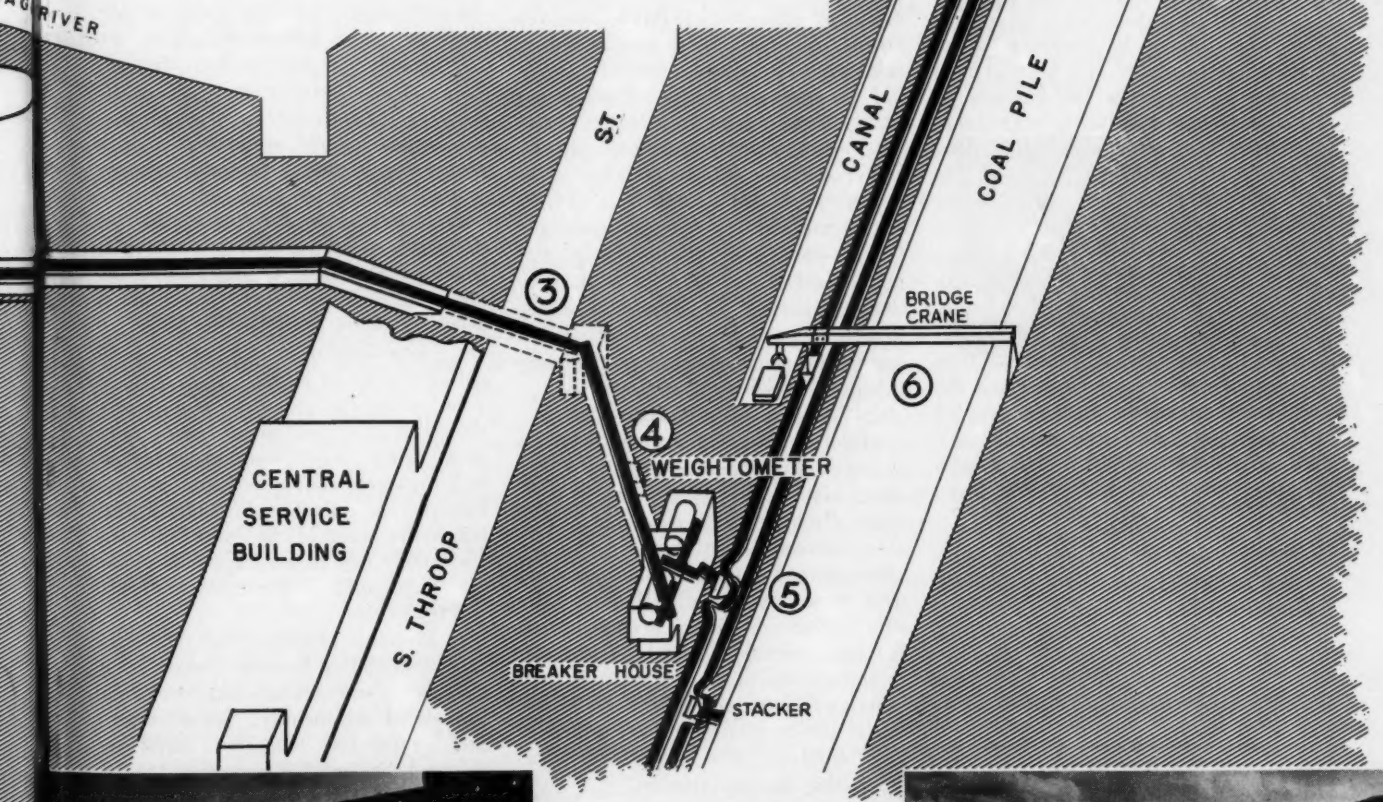
Starting beneath the Loomis breaker house, the new belt travels underground until it reaches the west side of Throop Street. There it changes direction and starts upward, emerging from the ground just east of Throop Street at the south end of the Central Service Building. At a height of approximately 35 feet it travels horizontally. Again it changes direction and angle, pointing southeast and terminating in a junction tower above the station at an elevation of 114 feet.

At present only one belt travels through the structure but provisions have been made for the installation of a second one when required. It is 42 inches wide, travels at a speed of 500 feet per minute and has a carrying capacity of 800 tons per hour.

Coal taken either from barges in Sampson's Canal or from the Loomis storage pile passes through the breaker house where it is crushed to approximately one and one-quarter inch size. Magnetic pulleys located in the breaker house separate tramp iron from the coal.

An automatic coal sampler in the junction tower (point 1) extracts a sample of coal every 40 seconds. This is sent to the Testing Department where it is analyzed to determine the BTU content per pound.

Conveyor attendants appear at the weightometer which records weight as coal passes.



At left is the Loomis breaker house. Structure leading to it houses a belt which transfers coal from the unloader, a conveyor that diverts coal from long belt shown in picture at right.

Capacity of the storage pile at right is 250,000 tons. This picture shows a portion of the pile and the gantry crane which can select coal from pile or from barges in Sampson's Canal.

What Makes Successful Executives?

Dr. Burleigh B. Gardner
Executive Director, Social Research, Inc.
Chicago, Illinois

Condensed from an article by Dr. Gardner which appeared in Advanced Management, Quarterly Journal of the Society for Advancement of Management, September, 1948.

In choosing younger men for promotion into the executive ranks, how can the potentially successful executive be recognized in advance?

Many executives have found that persons of high intelligence and practical competency often turn out to be ineffective when placed in positions of increased responsibility. It is not that these persons do not know the business or lack the technical skills. It is rather in the area of their relations with others on the job and their behavior within an organization that the real difficulty is found.

Research done on the problem of executive selection has lately come up with the reasons for such failures. Techniques recently developed at Harvard University and fashioned into workable tests by Professor W. Lloyd Warner and Dr. William E. Henry of the University of Chicago, have given us the answers. We now know how to uncover such failures in advance and prevent them.

Personality Traits Listed

Application of these tests among six nationally known business enterprises, now show (1) that it is not only possible but practical to test junior executives in quick form and determine in advance whether they have the stuff of which successful business executives are made, and (2) that the characteristics of the successful, practicing executives can be designated clearly.

From the extensive testing done with junior and senior executives, it is now clear that "successful" business executives have many personality "traits" in common. It is also clear that absence of these characteristics is coincident with "failure" within an organization. The emerging group of "traits" might be thought of as the minimal requirement for "success" within the executive role. Despite the differences among men, the common personality structure of the successful executive has the following eleven "traits," all of which can now be spotted in advance by the new tests.

1. *Achievement Desires.* The pleasure of accomplishment is a potent drive among able executives. They must accomplish and achieve in order to be happy. They do derive satisfaction from the contemplation of future ease, and they do gain pleasure from prestige. Far more real to them, however, is the continual stimulation which arises from the immediate tasks well done. It is that passion for achievement, more than anything else, which animates them.

2. *The Idea of Authority.* The successful executive's idea of authority is that it does not hamper, inhibit, or constrain him; he accepts it without resentment. He looks to his superiors as persons of greater training and experience whom he can consult on problems and who issue guiding directives to him which he accepts without prejudice. This is a most necessary attitude for the successful executives, since it controls their reaction to superiors.

Executives who view their superiors as prohibiting forces have trouble working within an organization.

3. *Strong Mobility Drives.* Successful executives characteristically have strong mobility drives but the drive is directed toward achievement, material rewards and prestige in that order. Material rewards and prestige will keep the individual working with zeal equal to that aroused by a desire for achievement. But the particular kind of work and position which will interest men will differ with the nature of their mobility drives. The successful executives' drive, however, is always first aimed at achievement.

4. *Organizational Ability.* The ability to bring order out of chaos is another characteristic of successful executives. Also, all of them have the ability to take seemingly isolated events or facts and see relationships that may tie them together. In short, they can organize efficiently. Further, they are interested in looking into the future and are concerned with predicting the outcome of their decisions and actions.

5. *Decisiveness.* The characteristic of decisiveness does not mean that an executive must make quick and final decisions in rapid fire succession, although some do. More crucial is the ability to come to a decision among several alternative courses of action—whether it be done on the spot or after detailed consideration. Very seldom does this ability break down. While less competent and well organized individuals may become flustered and operate inefficiently in certain spots, most of the successful men force their way to a conclusion. Nothing is too difficult for them to tackle and try to solve.

6. *Firmness of Conviction.* One way of differentiating between people is in the relative strength or weakness of their notions of self-identity. Some persons lack definiteness and are easily influenced by outside pressures. Some, such as successful executives, are firm and well-defined in their sense of self-identity. They know what they are and what they want, and they have well developed techniques for getting what they want within the framework of their desires and within the often narrow possibilities of their own organization.

7. *Activity and Aggression.* Successful men have a constant drive to be moving and doing. The executive is essentially an active, striving and aggressive person, although not necessarily so outside of business. This activity and aggressiveness are always well channellized into work or struggles for status and prestige. There is a constant need to keep moving, to do something, to be active.

This does not mean that they are always in bodily movement or moving physically from place to place (though this is often true), but rather that they are mentally and emotionally alert and active. This constant motivator unfortunately cannot be shut off. It may explain why so many executives find themselves unable to take vacations leisurely or to stop worrying about already solved problems. A possible contributory fact is seen in the following point.

8. *The Need to Overcome a Sense of Frustration.* Successful executives have a pervasive fear of failure. If one is continually active, always making decisions and grappling with problems, any inability to do so successfully may well result in feelings of frustration. This seems to be true of executives. In spite of their firmness of character and their drive to activity, they also harbor a rather pervasive feeling that they may not really succeed and be able to do the things they want.

9. *Realism.* As opposed to those who may be overidealistic and lack practical sense, successful executives are strongly aware of immediate realities and their implications. They keep their feet on the ground. They are interested in the practical, the immediate and the direct.

However, a too strong reality sense that does not find the realities in tune with the individual's ambitions may well leave a further sense of frustration and of the unpleasantness of reality. This happens to many executives who find progress and promotion too slow for their drives. The result is often a restlessness rather than activity, a fidgetyness rather than a well channellized aggression, and a lack of ease that may well disrupt many of their usual personal relationships.

10. *Relations with Others.* In general, the mobile and successful executive looks to his superiors with a feeling of personal attachment and tends to identify with them. His superiors represent for him a symbol of his own achievement and activity desires, and the successful junior tends to identify himself with these traits in those who have achieved more. He thus is very responsive to his superiors—the nature of this responsiveness of course depending on his idea of authority, and the extent to which his sense of frustration is present.

On the other hand, he looks to his subordinates in an essentially impersonal way, seeing them as "doers of work" rather than as people. This does not mean he is cold and treats them casually. In fact he tends to be rather sympathetic with their problems. But he still treats them impersonally, with no real or deep interest in them as persons. It is almost as though he viewed his subordinates as representatives of things he has left behind, both factually and emotionally. The only direction of his emotional energy that is real to him is upward and toward the symbols of that upward interest, his superiors.

11. *Attitude Toward Parents.* In a sense the successful executive is a "man who has left home." He feels and acts as though he were on his own, as though his emotional ties and obligations to his parents were severed. It seems most crucial that he has not in addition retained resentment of his parents, but has rather simply broken their emotional hold on him and been left psychologically free to make his own decisions.

These eleven traits of successful executives are all intertwined. Various traits may be dominant over others; but they are all present in varying degrees in efficient business managers. But how are these traits dug out by the psychologists? How can they be detected in younger men being considered or groomed for promotion into the executive ranks?

Elements of Inquiry

Three techniques are used: (1) the Thematic Apperception Test, (2) directed interview, and (3) free association interview.

The basic test is the first, known as TAT, which was originated at Harvard as a psychological tool for exploring personality and getting people to project outwardly what they feel and believe. It was then redesigned to explore personality for specific traits. This was done by the Committee on Human Development at the University of Chicago.

In the test, cards with specially-designated pictures are presented to applicants. The responses tell the psychologist about the personal relations of the subject—something which the subject can not hide in his answers.

The answers to the TAT pictures are evaluated by another psychologist, and a directed interview follows, based on the answers given to TAT pictures. This amplifies and clarifies the character analysis obtained from the pictures.

Finally, prospective executives are interviewed by the free-association method. When the men tell about their own personal problems, further checks are obtained on the results from the other tests. More knowledge is obtained about the men's personal outlook, and how an executive position fits into their social needs. The time involved for the complete test is about 50 minutes, although the psychologists' analysis of the responses takes about five hours.

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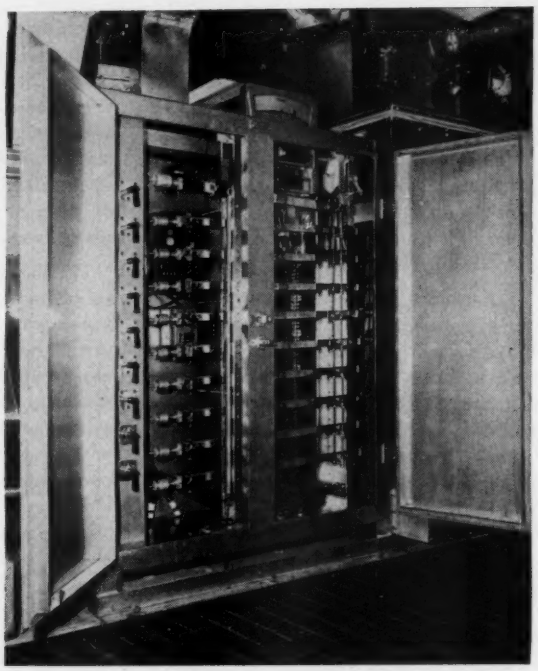


Electrically operated multiple beam scales used in pre-mixing bakery ingredients.

A novel plant, which is almost completely automatic in operation, was opened this summer in Springfield, Illinois, by Pillsbury Mills, Inc., for the manufacture of "pre-mix" food products. Although dwarfed by three adjacent flour mills, the 180 x 300 foot two-story plant cost in excess of $1,000,000. Contributing to this cost was the maze of piping through which the various ingredients are transported and the intricate electrical control system. Much of the plant area is actually devoted to laboratory and office quarters and storage, with the manufacturing largely centered in a 110-foot tower rising above the center of the building.

The offices and laboratories are air conditioned for humidity and temperature. The two warehouses—raw materials warehouse and finished products warehouse—and the manufacturing area, are controlled independently at different suitable temperatures.

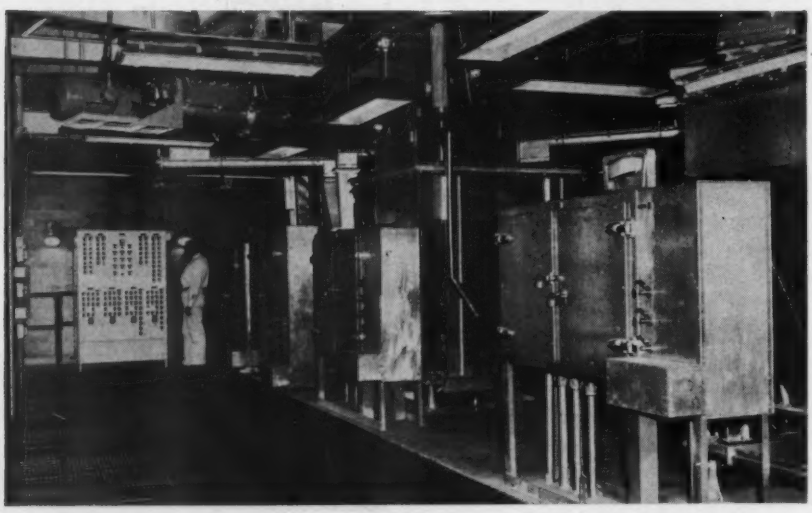
Products of the plant include doughnut and cake mixes which are used by large consumers such as bakeries, hotels, restaurants, etc. The principal ingredients required are flour and sugar, with lesser amounts of shortening, salt, sodas, powdered milk and dried egg yolk.

Flour, used more than any other ingredient, comes from the nearby mills pneumatically and is poured into flour storage bins in the flour section of the tower.

Sugar, second largest bulk ingredient, comes in specially designed bulk sugar cars dumped at a railroad unloading point. It is pneumatically carried to storage bins on the first floor which have a total capacity of four car loads. Sugar can be pulverized to any desired fineness, or it can by-pass the pulverizer.

Liquid shortenings are received in bulk form and pumped to storage tanks

Control panel which electrically and electronically operates all movements. It stands beside the multiple beam scales in padlocked cabinets.



in the tower. Miscellaneous ingredients are received and stored in the temperature-controlled raw materials warehouse.

From here, electrically operated industrial transport trucks move the ingredients to a central feed-in point. Then they are taken pneumatically to bins in the tower. Thirty bins are provided for storage with capacity to operate the plant for two eight-hour days.

From the storage bins all materials flow to scales, sifters, mixers, and packaging equipment in an electrically timed and controlled pattern. Electronic equipment is used extensively to secure a high degree of accuracy. Some time the mixing operations and maintain correct temperatures. Others control the flow of goods through the plant.

Four multiple beam scales, with from three to nine beams each, provide for weighing as many as 25 ingredients for a particular operation. Setting of these scales is done manually each time a different formula is to be mixed. When the predetermined amounts of all ingredients are ready, a signal glows at the central control point.

All operations are controlled from an electrical display and switch panel. This panel monitors all operations, i.e., 126 condition of all bins, the operation of signal lights indicate the full or empty all scales, when weight is correct, etc. The flow of material is followed on a diagram laid out on the control panel.

Manufacturing Procedure

The manufacturing process starts with the measurement of ingredients by weight before mixing. Any specific formula can be followed—just as in bakery mixing. A scale man sets up the amount of ingredients necessary, using the poises on the four multiple beam scales.

After he has set the formula, the scale man goes to a control panel, from which he runs all the operations. A push of a button and the gates of the storage bins open, to close only when the exact weight has been recorded on the scales.

The operator can test all these lights with a single button. Failure of one light could give false information about the mixing, so care is taken to guard against this error.

When the formula is complete, a signal light gleams that a batch is ready. Then the operator takes over control of the ingredients.

In a timed sequence, ingredients go through sifters to mixers. When shortening is to be introduced it is injected by automatic metering devices in an exclusive Pillsbury process. When the mixing is over, the material flows into conveyors to the packing floor.

Electronic Detector

In one final operation, all finished packages are examined under an electronic detector which automatically rejects all packages in which any trace of metal is detected.

From the packing floor loads are placed on a pallet and conveyed to the temperature-controlled finished goods warehouse for storage or loading aboard transportation.

The equipment is capable of mixing a 3,000 pound "batch" of material at one time, the manufacturing interval varying, of course, with the formula used. And incidentally, it takes only 30 people to keep the plant going.

Aerial view of Pillsbury Mills' new bakery mix plant at Springfield, Illinois. The new plant is the smaller building in the corner of the triangle. Flour is fed pneumatically from the mill across the railroad tracks.

The Engineer Prepares for Management

A symposium of opinions representing industry, education, and personnel counselling, sponsored by the Communications Section, November 7, 1949

Dr. Gustav Egloff, Moderator
Universal Oil Products Co.

Dean William A. Lewis, Jr.
Graduate School
Illinois Institute of Technology

Dr. Edwin D. Martin
Inland Steel Company

Dean Ovid W. Eshbach
Technological Institute
Northwestern University

Gifford B. West
Illinois Bell Telephone Co.

Wm. H. Harrison, Jr.
Social Research, Inc.

A round-table discussion on the subject, "The Engineer Prepares for Management," has been arranged by the Communications Section of Western Society of Engineers, for November 7, 1949, WSE Headquarters, 7 p.m.

There will be two representatives of industry, two representatives of leading Chicago-area universities, and a representative of a personnel counselling service.

Each man will discuss one aspect of the subject, such as personality traits necessary for management positions, the undergraduate and graduate school curricula, and the various methods used by industry to prepare engineers for management responsibilities.

Because of the recent trend toward greater recognition of the engineer in management positions, this discussion is very opportune. The responsibilities of the engineer to improve his own status through participation in technical society programs and activities outside of his chosen profession will also be covered.

After the individual topics are presented, the moderator will direct discussion among the panel members. This will be followed by a question-and-answer period in which the audience is invited to participate.

Dean William A. Lewis, Jr.

Representing education will be Dean William A. Lewis, Jr., of the Graduate School, Illinois Institute of Technology. He is a native of Harriman, Tennessee, and was graduated from California Institute of Technology, with the B.S. degree in 1926, M.S. degree in 1927, and Ph.D. in 1929.

He was associated with the Westinghouse Electric and Manufacturing Company in many branches of their engineering department until 1939, when he became Director of Electrical Engineering at Cornell University. He came to Illinois Institute of Technology in 1944 as Research Professor in Electrical Engineering and Consultant to Armour Research Foundation. He was appointed Dean of the Graduate School in 1946.

Dr. Lewis is a Fellow in the American Institute of Electrical Engineers and a member of Western Society of Engineers. He is a member of Tau Beta Pi and other fraternities. He has been a frequent contributor to the magazine, "Electrical Engineering."

Dean Ovid W. Eshbach

Dr. Ovid W. Eshbach, also representing the educational field, is Dean of the Technological Institute, Northwestern University. He was born in Pennsburg, Pennsylvania. He received the degree of Electrical Engineer in 1915 and Master of Science in 1920 from Lehigh University. He also holds a Doctor of Science degree from Ursinus College, granted in June, 1939, and a Doctor of Engineering degree from Lehigh University, granted June, 1948.

Following his release from service in World War I, he returned to Lehigh as instructor and assistant professor of electrical engineering. In 1923 he joined the engineering department of the Bell Telephone Company of Pennsylvania, and in 1925 he was transferred to the American Telephone and Telegraph Company in New York. In the latter assignment, as special assistant in the Personnel Department, he was principally concerned with the employment, introductory training, and progress of technical and other specially trained men. He came to Northwestern in 1939.

Dean Eshbach is a member of the Western Society of Engineers, Engineers' Council for Professional Development, and the American Society for Engineering Education. He is a Fellow of the American Association for the Advancement of Science, and of the American Institute of Electrical Engineers, and a member of several fraternities including Tau Beta Pi. He was editor-in-chief of the "Handbook of Engineering Fundamentals," published in 1936.

Dr. Edwin D. Martin

Representing industry will be Dr. Edwin D. Martin, Assistant Manager of the Metallurgical and Inspection Department of Inland Steel Company.

He received the degree of Bachelor of Science in Metallurgy from Massachusetts Institute of Technology, and the Doctor of Science degree from the University of Nancy, France. He studied at the Graduate School of Mines in France and Heidelberg University.

Dr. Martin worked for many years with Thos. A. Edison, and was Vice President of Thos. A. Edison, Inc. He has been with Inland Steel Company since 1935.

He is a member of the American Iron and Steel Institute, American Institute of Mining and Metallurgy, and other engineering organizations.

Gifford B. West

Gifford B. West, another industry representative, is Chief Engineer of the Chicago area of the Illinois Bell Telephone Company. Born in Newburg, Indiana, he received his B.S. degree from the University of California in 1910.

He was employed as the General Traffic Engineer of the Chesapeake and

ANNUAL FALL DINNER OCTOBER 31

Col. George Goddard to Present Three-Dimensional Films Made by Unusual New Photographic Technique

(*Continued from Page* 14)

Potomac Telephone Company from 1917 to 1925, when he was transferred to the Illinois Bell Telephone Company as Plant Extension Engineer. In 1928 he was appointed Chief Engineer of the State Area, and in 1946 was appointed Chief Engineer of the Chicago area.

Mr. West is a Fellow in the American Institute of Electrical Engineers and is a member of the Executive Committee of the Chicago section. He is a member of the Western Society of Engineers.

Wm. H. Harrison, Jr.

Wm. H. Harrison, Jr., representing the personnel counselling field, is Director of Training for Social Research, Inc. He received the Bachelor of Arts degree from Dartmouth University, the Master of Arts in Sociology from Columbia University, and is a member of the Economics Club of Chicago.

Dr. Gustav Egloff

Dr. Gustav Egloff, the moderator, is familiar to all WSE members as this year's president. He has been Petroleum Technologist for Universal Oil Products Company since 1944, and was Director of Research for the same firm from 1917 to 1944. His earlier positions included a year with the U. S. Bureau of Mines, 1915-16, and a year with the Aetna Chemical Co., Pittsburgh.

He was graduated from Cornell University in 1912, received an M.A. degree from Columbia University in 1913, a Ph.D. degree from Columbia in 1916, and several honorary degrees from other universities.

He is a member of numerous scientific organizations, in addition to WSE. He is a recipient of the Octave Chanute Medal of WSE, the Gold Medal of the American Institute of Chemists, and other awards.

The Annual Fall Dinner of the Western Society of Engineers will be held Monday evening, October 31, in the Grand Ballroom of the Sheraton Hotel on North Michigan Avenue.

Col. George Goddard, Chief of the Air Force Photographic Lab, Wright Field, Dayton, Ohio, will be the speaker.

He will present the sensationally new stereoscopic-strip bomb damage photographs in full color. This type of aerial photography is a relatively recent development and has been shown only to a few select audiences in this country. Unusually large projection machines and projection screen are employed.

The cameras used in taking these pictures are called stereoscopic-strip cameras, and consist of two lenses, one taking the scene as it would appear if viewed forward of the direction of flight, the other viewing the ground as if viewed rearward of the line of flight.

The lenses permit the two images to be recorded on a multi-layer color film 9½ inches wide and designed especially for aerial photographic use.

In the projection of the pictures, a specially designed projector is used, consisting of a double optical system, each with a polarizing screen in front of the lenses, set to polarize each beam at 90° to the other.

The audience is furnished with Polaroid glasses made in such a manner that one eye sees the right picture and the other eye sees the left picture, thereby allowing the viewer to fuse the image into a stereoscopic view.

Col. Goddard's career has been devoted to aerial photography. He became engaged in the field in World War I and for over thirty years has had the distinction of being considered one of the foremost authorities on aerial photography, having been credited with many "firsts" in this field, notably night photography by pyrotechnic illuminants, such as was used in September of this year in Chicago, and in reconnaissance photography at high altitudes.

Join your friends—reserve a table for your associates, and enjoy the satisfaction of having seen what few others have had the privilege of viewing.

You can achieve a "first" by attending your WSE Annual Fall Dinner October 31 at the Sheraton Hotel, 505 North Michigan Avenue.

ANNUAL FALL DINNER

Monday — October 31, 1949 — 6:30 P.M.

Sheraton Hotel
505 North Michigan Ave.
Fellowship 5:30-6:30

To the Secretary, Western Society of Engineers
84 E. Randolph Street

ENCLOSED IS REMITTANCE OF $.....for.....Tickets.

Tickets, $4.50 inc. tax and tip.
Tables seat 10. Make your group reservation early.

Date..... Signed .....

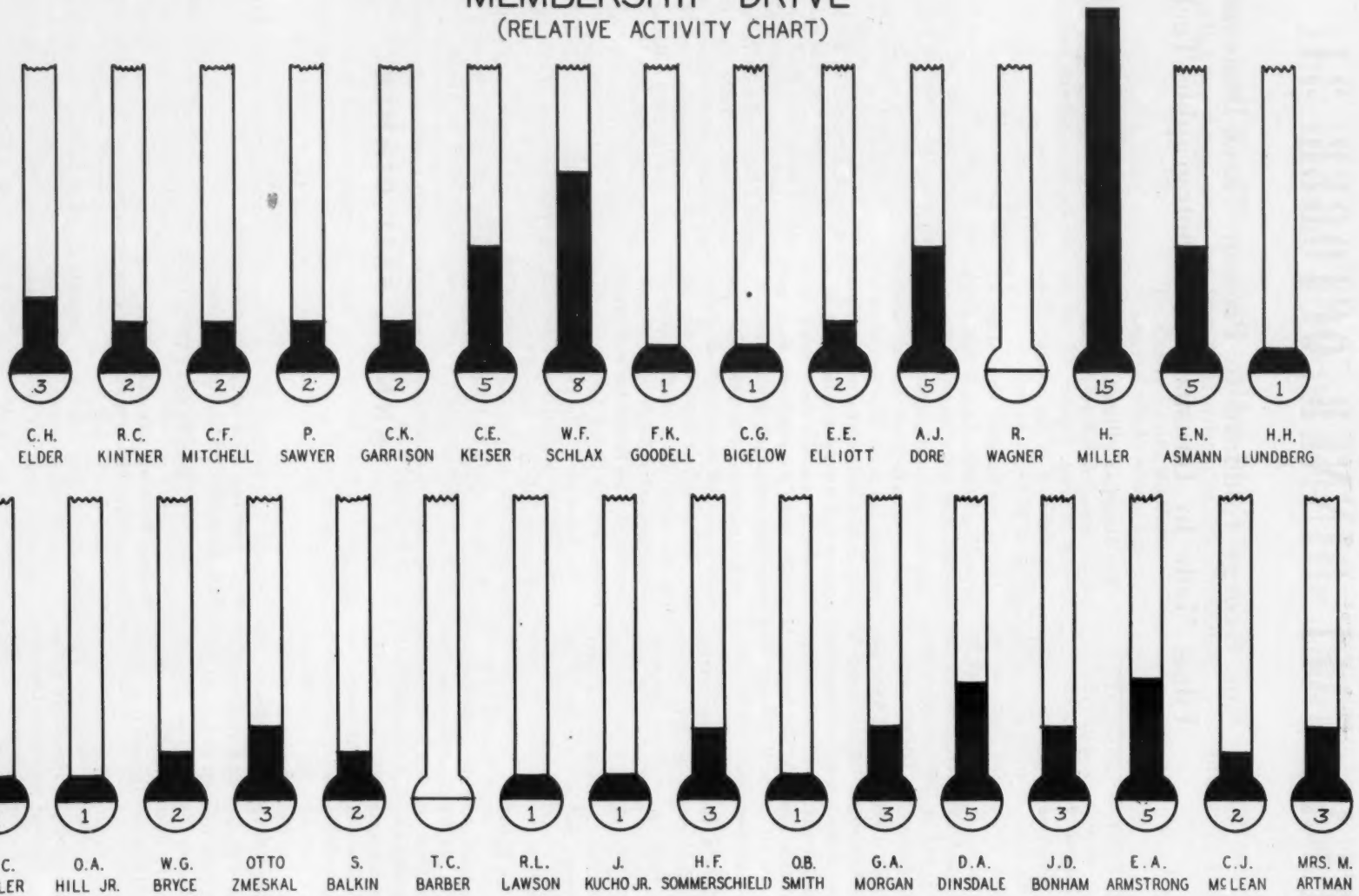
Address .....

Make checks payable to the Western Society of Engineers
No refunds made after 1 p.m., October 31

WESTERN SOCIETY OF ENGINEERS

MEMBERSHIP DRIVE

(RELATIVE ACTIVITY CHART)



Every Member Get A Member!

New Applications (to September 20)

86

These men have secured their New Members — some of them more than one.

Since September Issue

Balkin, S. F.
Buxton, B. L.
Dartsch, F. A. L.*
DeWolfe, E. C.
Egloff, Gustav*
Elder, Clarence H.
Elliott, E. E.
Gabbard, L. C.*
Hecht, J. L.*
Jackson, A. L.
Jelinek, O. K.
Keith, A. W.
Kelly, R. R.
Kucho, Joseph, Jr.
Lockwood, L. E.
Marsh, Edward J.
Melnick, T.
Michaels, E. E.
Miller, Herbert R.*
Randall, Edwin A.
Sawyer, Percy
Schick, N.
Schmitz, C. E.
Sedwick, H. P.*
Strazz, A. J.
Taylor, O. H.
Tuttle, L. W.
Weeks, L. E.
Wier, R. J.
Wilkins, D. C.
Williams, Kenneth
Wolfe, Thomas

* Also last period.

Before September Issue

Anderson, Bolton G.
Artman, Mrs. M. E.
Bailey, G. G.
Becker, D. N.
Bernhard, L. F.
Culp, E. R.
Dartsch, F. A. L.
Davies, F. C.
DeLeuw, C. E.
Egloff, Gustav
Fredrick, T. C.
Gabbard, L. C.
Guthrie, R. M.
Hanson, C. D.
Hecht, J. L.
Imhoff, Eldon
Kahler, W. V.
Kawiecki, C. J.
Kerr, A.
LeClair, Titus G.
Mee, C. L.
Miller, Herbert R.
Murphy, Miss Mary L.
Perkins, Miss Ruth
Sargent, Ralph
Sedwick, H. P.
Skog, Ludwig
Sykes, Wilfred
Tornquist, E. L.
Vanderkolk, W. W.
Wade, J. William
Whiting, F. T.
Witt, J. C.

1. Each member is urged to cooperate in this Membership Drive.
2. Do your part for WSE by securing your one "New Member."
3. You are in one of the following groups according to the alphabetical listing of your name.

Group	*Leader*
1. Abbott, F.—Bacon, R.	—Elder, C. H.
2. Badger, R.—Bennett, J.	—Kintner, R. C.
3. Bennington, S.—Bragdon, H.	—Mitchell, C. F.
4. Bramsen, S.—Campbell, J.	—Sawyer, P.
5. Campbell, R.—Cooke, R.	—Garrison, C. K.
6. Cooper, F.—Dencer, F.	—Keiser, C. E.
7. Dening, R.—Eppel, S.	—Schlax, W. F.
8. Epstein, A.—Fosnot, H.	—Goodell, F. K.
9. Foster, R.—Goetz, M.	—Bigelow, C. G.
10. Golden, M.—Haeffner, J.	—Elliott, E. E.
11. Haeger, M.—Henderson, R.	—Dore, A. J.
12. Hendren, R.—Horton, H.	—Wagner, R.
13. Houser, A.—Johnson, B.	—Miller, H.
14. Johnson, C.—Kien, W.	—Asmann, E. N.
15. Kientz, G.—Kucinski, W.	—Lundberg, H. H.
16. Kuehl, A.—Lindquist, B.	—Giller, W. C.
17. Link, O.—McHugh, C.	—Hill, O. A., Jr.
18. McJohnston, C.—Meissner, J.	—Bryce, W. G.
19. Molin, L.—Munster, R.	—Zmeskal, Otto
20. Murback, E.—Olsen, E.	—Balkin, S.
21. Olsen, R.—Peterson, J.	—Barber, T. C.
22. Peterson, R.—Reeves, W.	—Lawson, R. L.
23. Rehm, F.—Rumely, R.	—Kucho, Jos., Jr.
24. Runde, E.—Schuber, J.	—Sommerschield, H. E.
25. Schubert, A.—Smith, D.	—Smith, O. B.
26. Smith, E.—Strassen, R.	—Morgan, G. A.
27. Strasser, R.—Tucker, B.	—Dinsdale, D. A.
28. Tucker, S.—Warren, A.	—Bonham, J. D.
29. Warshaw, M.—Williams, R.	—Armstrong, E. A.
30. Williams, S.—Zwerg, H.	—McLean, C. J.
31. Women's Council	—Artman, Mrs.

LOUIS C. GABBARD, *Membership Chairman*

CRERAR LIBRARY Notes and News

Registration of readers is a new venture in the program of The John Crerar Library, designed to supply information about readers and their research needs. The information obtained is needed by the Library to study and improve its services.

Every library wishes to improve its services to the research workers and students who make use of its facilities. Most public libraries, however, are handicapped in working toward this objective because they lack adequate information concerning the people who use the library.

It is expected that this registration system will contribute to the improvement of the Library services in two ways. In the long range, the Library will be able to improve its collections and services on the basis of knowledge of the use made of the Library. As an immediate objective, it is hoped that it will be of advantage to the reader because he will need to do less writing on the call slips.

* * *

The Research Information Service completes its first formal year of fee services on September 30. During this period companies and professional men have been able to arrange with the Library to carry out literature searches fundamental to their research activities. This service is offered on a non-profit basis, the objective being for the Library to be reimbursed for its direct operating costs and standard overhead charges relating to the activities of the Research Information Service.

More than seventy companies and individuals have availed themselves of this service during the past year. The most important project of Research Information Service at present is the work it does for the Atomic Energy Commission. Under this program an effort is made to locate every currently published technical report of significance to atomic energy research. Abstracts of these reports, prepared by the staff of Research Information Service, are published in *Nuclear Science Abstracts* issued by the Atomic Energy Commission at Oak Ridge, Tennessee.

WSE Personalities in the News

In a recent announcement of appointments to key committees of the American Institute of Architects, Ralph Walker, of New York, A.I.A. President, named eight Chicagoans, including John W. Root, Senior Partner of Holabird & Root & Burgee, and a WSE member.

* * *

Dr. Walter H. Voskuil, Mineral Economist of the State Geological Survey, and a WSE member, has returned to Urbana from a trip through the East. From August 22 to 26 he attended the United Nations Conference on the Conservation and Utilization of Resources, at Lake Success, New York, and participated in the sections on mineral fuels and other minerals.

Of fundamental interest to this and other countries, Dr. Voskuil reports, are the problems arising from the approaching depletion of the choicest resources of both iron ore and of coking coal. The coking coals in question, Dr. Voskuil explains, are those from which metallurgical coke, now essential in steel making, is made. The conference revealed diverse ways in which the problem is being attacked by technologists of different key nations.

There were British and French reports on methods for preparing high-grade metallurgical coke from coals of poor coking quality, a Swedish report on an electric process for making coke from non-coking bituminous coal, and a Canadian paper on methods of reducing the amount and quality of coke needed in smelting iron ore. Canada, although it has abundant iron and coal, lacks coking coal suitable for iron smelting and steel making, according to Dr. Voskuil.

* * *

Frank E. Richart, Research Professor of Engineering Materials, University of Illinois, has been elected national Vice President of the American Society for Testing Materials. New members of the Board of Directors include: Harrison F. Gonnerman, Assistant to Vice President for Research and Development, Portland Cement Association, Chicago, and M. O. Withey, Dean of the College of Engineering, University of Wisconsin, Madison, Wisconsin. They are members of WSE.

Obituaries

Benjamin Wolhaupter

Benjamin Wolhaupter died July 20, 1949, at his home in Silver Mine, Norwalk, Connecticut.

He joined WSE in December, 1890, and had been a Life Member since 1938, as a non-resident.

He was born in Fredericton, New Brunswick, in 1859, attended Victoria College, later a part of Toronto University, and completed his training in engineering by serving apprenticeship in machine shops and on surveying expeditions. He became a naturalized citizen of the U. S. in 1900.

He was concerned chiefly with railroad track improvements, obtaining about 215 patents on devices of this type. He was awarded medals at the Columbian and Louisiana Purchase Expositions in 1893 and 1904 for railroad safety inventions.

From 1905 to 1929 he was an executive of the Rail Joint Company, later absorbed by Poor and Company. .Since his retirement, he had lived in Connecticut.

Isaac F. Stern

Isaac F. Stern, who had been a member of WSE since 1904, died September 10. He was active in Bridge and Structural Engineering Section activities, as well as on several Society committees. He was chairman of the Consulting Engineers Division from 1937-39.

He had been associated with Wm. Sooy Smith in 1895, and later with the Sanitary District of Chicago, Illinois Central Railroad, and the Chicago & North Western Railway Company.

President Addresses Several Groups

Dr. Gustav Egloff, president of Western Society of Engineers, spoke before a number of national and local organizations during September, and has several others scheduled during October.

September 16 he appeared on the ABC-Bar Association program, ON TRIAL. The subject was, "Is the loyalty program for scientists a necessary and reasonable security measure, or does it involve undue restrictions on the civil liberties of scientists?", and Dr. Egloff took the stand that the loyalty program is a necessary measure. The program was televised over the ABC network.

Dr. Egloff attended the National Petroleum Association meeting in Atlantic City September 14 to 17, and the American Chemical Society National Meeting in the same city September 18 to 23.

On October 5, Dr. Egloff will lecture before Roosevelt College, Chicago, on the subject, "Have We Enough Petroleum?" as the third of a series by ten outstanding men of science under the general title of "New Frontiers of Science and Industry."

He will speak before Northwestern University engineering students on October 6, at a meeting sponsored by the N.U. Student Chapter of the American Institute of Chemical Engineers. His subject will be, "The Engineer in the Oil Industry."

Dr. Egloff will speak on "Research in the Oil Industry" before the Kiwanis Club of Milwaukee on October 19, and the Kiwanis Club of Racine on October 20. These talks will be a part of the national observance of Oil Progress Week.

Wednesday, October 26, Dr. Egloff will speak before the Petroleum Section of the 37th National Safety Congress and exposition, in the Florentine Room of the Congress Hotel, Chicago. His paper is entitled: "Pioneering with High Pressure Oil Equipment."

Plans Fire Prevention Week October 9-15

Chicago's observance of Fire Prevention Week, October 9 to 15, as proclaimed nationally by President Truman, should hit a new high in effectiveness, according to Elmer F. Reske, chairman of the committee in charge, and a WSE member.

Mr. Reske, manager of the Cook County Inspection Bureau, heads a committee composed of insurance and business executives co-sponsored by the Cook County Inspection Bureau, the Chicago Fire Department, and the Chicago Association of Commerce and Industry.

The program will include a speaker's bureau, directed by D. P. Shaer, assistant manager of the Cook County Inspection Bureau, and special fire prevention assemblies in every public and parochial school in the city.

Purpose of the school assemblies, it was explained, is to distribute "home inspection blanks" to be taken home and filled out by the children. The blanks are furnished by the Chicago Fire Department and the Cook County Inspection Bureau, and are credited with eliminating "many hundreds" of fire hazards in homes.

Through the schools, also, an "illustrated poster" contest will be carried on, with the prize award of $300 furnished by Marsh & McLennan, Inc., in the Day School at the Art Institute.

French Industrial Specialists Begin Sessions at WSE

A group of 25 industrial specialists from France arrived by plane in the U.S. on October 3, and after an hour's landing in New York to service the plane, continued on to Chicago and WSE Headquarters, to attend a twelve day seminar series in our small auditorium.

The French Gray Iron Foundry Project, the official designation of this group who will tour industrial America, and the Chicago metropolitan area in particular, is sponsored by the Economic Cooperation Administration of the U.S. Government, Washington, D. C.

Elliott S. Hanson, Chief of the Arrangements Branch of the Technical Assistance Division, and Technical Consultant Commander R. N. Fitzgerald, completed the arrangements with the Executive Secretary of WSE during their recent visit to Chicago.

The group will be under the direct supervision of Charles W. Kerwood, project manager for Mr. Hansen.

Seminar sessions are being held in our small auditorium October 3 to 7, October 10 to 14, and October 17 to 19 inclusive, from 9 a.m. to 11:45 a.m. Speakers now being scheduled include leading industrialists and engineers from Detroit, Minneapolis, Pittsburgh, and the Chicago metropolitan area.

Each afternoon the Frenchmen will be taken on tours of industrial plants in the area.

Dr. Gustav Egloff, president of WSE, and members of the Board, as well as local civic leaders, welcomed the Frenchmen at a meeting and reception at WSE headquarters, Monday afternoon, October 3.

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Members Active In Conference

Titus G. LeClair, Past President of WSE and H. P. Sedwick, Vice President of WSE, and more than 90 members of the Society, were active in a conference of 450 utility executives and engineers at Lake Lawn, Delavan, Wisconsin, September 14, 15 and 16.

The Inter-Company Engineering Conference had as its Chairman, Mr. LeClair, Assistant Chief Electrical Engineer of Commonwealth Edison Company. The conference, held for the sixth year, is made up of representatives from the Edison Group of companies, Commonwealth Edison Company, Public Service Company of Northern Illinois, Western United Gas and Electric Co., Illinois Northern Utilities Company, and a CE subsidiary, Chicago District Electric Generating Company.

Planned to give engineers a look at non-engineering matters, the conference featured technical sessions, informal entertainment, golf, and talks by company executives.

The conference opened September 14 with three top officers present, including C. Y. Freeman, Chairman of the Commonwealth Edison Group of companies, E. J. Doyle, President of Commonwealth Edison Company, and Britton I. Budd, President of Public Service Company of Northern Illinois. After informal remarks by Mr. Freeman, Mr. Budd spoke on "The Inter-Company Committee on Operations."

He told the conference that cooperative promotional efforts of the Edison companies had resulted in 548 new industries and branch plants arranging to locate in Chicago and northern Illinois since the end of the war.

"These plants," he said, "will employ about 69,000 people and will account for about six million dollars in annual electric and gas revenues to the four sponsoring utility companies."

Of the 548 new industries locating in the area since V-J Day, 111 were in Chicago and 192 in the nearby suburbs, he said. Another 41 moved into the Joliet-Will County area, 27 into the Kankakee area, 32 into the Waukegan-Lake County area, 46 to the Aurora-Elgin region, and 99 to other communities scattered across the northern part of the state.

Officials of the sponsoring companies and of the conference are shown above, left to right, Earl Wild, Secretary of the conference; E. J. Doyle, President of Commonwealth Edison Company; Britton I. Budd, President of Public Service Company of Northern Illinois; I. L. Wade, Vice Chairman of the conference (incoming Chairman); C. Y. Freeman, Chairman, Commonwealth Edison Group of Companies; R. H. James, President, Chicago District Electric Generating Company; T. G. LeClair, Conference Chairman.

WSE Men Participate

Six general sessions and four technical sessions were held, with the following WSE members taking part: I. L. Wade, Public Service; A. D. Caskey, Public Service; E. Wild, Commonwealth Edison; J. W. Baring, Commonwealth Edison; C. F. Mitchell, Commonwealth Edison; in addition to Mr. LeClair.

Officers of the conference for this year, all three of them WSE members, were, T. G. LeClair, Chairman; I. L. Wade, Vice-Chairman; E. Wild, Secretary.

Program Committee members who belong to WSE were: A. D. Caskey, Chairman; K. M. Smith, Secretary; M. J. Archbold, R. J. Hinch, and I. L. Wade.

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Hydraulics Parley Opens October 26

The fifth annual meeting of the National Conference on Industrial Hydraulics, the only occasion when those who work in industrial hydraulics can discuss mutual problems, will be held October 26 and 27 in the Sheraton Hotel.

The two-day program will present technical papers by some of the most authoritative speakers in the field of industrial hydraulics.

Among the subjects to be discussed is the operating hydraulics of a large water supply system. A paper on this subject will be presented by F. G. Gordon, assistant city engineer of the City of Chicago and a WSE member. Robert R. Richoldt, staff engineer for the Lockheed Aircraft Corporation, will describe the development of the hydraulic system of the Constellation airliner. Dr. Henry Rushton, Illinois Institute of Technology, will discuss applications of fluid mechanics to mixing. He is also a WSE member.

Five technical sessions are planned, including sessions on recent developments, hydraulic equipment components, design considerations, hydraulic equipment standards, and hydraulic circuit performance. E. M. Fucik, Harza Engineering Company, and a WSE member, will be chairman of the session on design considerations.

Dr. W. A. Lewis, Dean of the Graduate School, Illinois Institute of Technology, and a WSE member, will open the conference on Wednesday, October 26, at 9:45 a.m.

The October 26 luncheon session, will be led by Dr. H. A. Leedy, Director, Armour Research Foundation, and will feature R. A. Esch, Vickers, Inc., Detroit, Michigan, speaking on the subject, "What is Industrial Hydraulics?"

ECPD Sessions Begin October 28

The Engineers' Council for Professional Development will hold its 17th annual meeting at the Edgewater Beach Hotel on Friday and Saturday, October 28 and 29. Several of the sessions will be open to the public.

The Council is a conference of seven of this country's leading national engineering bodies, plus the Engineering Institute of Canada. It was organized in October, 1932, with the objective of enhancing the professional status of the engineer through the cooperative support of organizations which directly represent the professional, technical, educational, and legislative phases of an engineer's life.

To this end, ECPD aims to coordinate and promote efforts and aspirations directed toward higher professional standards of education and practice, greater solidarity of the profession, and greater effectiveness in dealing with technical, social and economic problems.

The Council's program for the two-day meeting will open on October 28 at 9 a.m. with registration, followed at 10 a.m. with a meeting of the entire Council in executive session.

Luncheon in the Marine Dining Room will feature two talks by speakers from the midwest. E. C. Koerper, Research and Engineering Laboratories of A. O. Smith Corp., Milwaukee, will discuss the "Milwaukee Plan of Aptitude Testing." WSE President Dr. Gustav Egloff, will speak on the "Activities of Local Engineering Societies."

An All-Society Banquet, a joint meeting with the participating societies will be held in the Boulevard Room, October 26, at 7 p.m.

Requests for copies of the program, or for reservations, should be addressed to Mr. S. F. Musselman, Conference Secretary, NCIH, Armour Research Foundation, Technology Center, Chicago 16, Illinois.

At 2:15 p.m., the delegates will meet in the North Terrace Room for the first session of the 17th Annual Meeting. Visitors will be welcome.

A reception will begin in the East Lounge at 6:30 p.m. with the ladies invited, and dinner will follow at 7 p.m. Dinner speaker will be Dr. Robert E. Wilson, Chairman of the Board, Standard Oil Company (Indiana), and his subject, "The Attitude of Management toward Research."

The program for Saturday, October 29 will begin at 9:30 a.m. in the North Terrace Room. This will be a continuation of the 17th Annual Meeting, and visitors are welcome.

Luncheon in the South Room will feature R. B. Stewart, Vice-President and Comptroller, Purdue University, on the subject, "Implications of Federal Support of Education and Research."

The concluding session of the Annual Meeting will begin at 2 p.m.

Inquiries regarding meeting arrangements and registration should be directed to George G. Lamb, Technological Institute, Northwestern University, Evanston.

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MEMOIR
Charles Adelbert Morse
Died April 12, 1949

Charles Adelbert Morse was identified with the railway industry throughout his entire professional career and was one of 15 outstanding railway engineers who served as president of the Western Society of Engineers.

He was born January 1, 1859, at Bangor, Me., the son of Charles B. and Elsie (Emery) Morse. His engineering education was obtained at the University of Maine, where he was graduated in civil engineering in 1879.

Mr. Morse entered the employ of the Chicago, Burlington & Quincy Railroad in 1880, as a chairman, serving later as instrument man and office man until November 1881. He was division engineer of the Mexican Central Railway from 1881 until the completion of that road in 1884. After further service with the Burlington for about 18 months, Mr. Morse went to work for the Atchison, Topeka & Santa Fe Railway in January 1886. Starting as a transitman, Mr. Morse served the engineering department of the Santa Fe a total of 27 years, advancing successively to division engineer, resident engineer, principal assistant engineer and assistant chief engineer at various locations in Iowa, Kansas, New Mexico, Colorado, and California. In 1909, he was appointed chief engineer of the Santa Fe System which position he held until April 1913.

Mr. Morse left the Santa Fe in April 1913 to become chief engineer of the Chicago, Rock Island & Pacific Railroad, retaining that position until his retirement at the age of 70, except for the period from September 1918 until June 1919 during federal control of the railroads when he served as assistant director of operations, engineering and maintenance of way, U. S. Railroad Administration.

He went to the Rock Island at the time that the physical condition of the property was at a low ebb and shortly thereafter the road passed through a receivership and federal control. But by 1929 through his personal persistent efforts, he had succeeded in getting the property into a high standard of physical condition.

Mr. Morse became a member of the Western Society of Engineers shortly after coming to Chicago upon entering the service of the Rock Island. He took an active part in a membership campaign carried on in 1921, and with a natural affability and democratic manner he did much to encourage young men to join the society and take part in the meetings. He was elected second vice-president in 1922 and a year later was advanced to the presidency.

Mr. Morse enjoyed the admiration and respect as well as the affection of his employers and subordinates alike. He was held in high esteem by all members of the society who had the privilege of knowing him.

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Plan Football Games Via T-V Saturdays

The Western Society of Engineers is inaugurating the Football Huddle in the Lounge every Saturday afternoon for the pleasure of its members and their guests.

Through the efforts of D. C. Peterson, WSE, Chief Engineer of Stewart-Warner Corp., and Stanley Kolanowski, Chief of their Television and Radio Division, a large Stewart-Warner television set has been made available to the Society.

The Huddle will start shortly after noon and the games to be broadcast will be listed in a forthcoming WSE News Letter.

Rain or shine, you will always have a good seat in the Lounge, where the fellow sitting next to you will talk your language.

If the demand justifies, the World Series Baseball Games will also be broadcast by television in the Lounge.

Spannhake Joins I.I.T.

Wilhelm Spannhake, an eminent specialist in the design and construction of turbomachinery, has joined the staffs of Armour Research Foundation and the Graduate school of Illinois Institute of Technology.

Dr. Spannhake will supervise and participate in both fundamental and applied research for industry at the Foundation. He will teach several new courses at the Illinois Tech graduate school.

Since coming to the United States two years ago, Dr. Spannhake has been a senior scientist at the David Taylor Model Basin, Bureau of Ships, Washington, D. C.

From 1921 until 1947 he was associated with the Karlsruhe Technische Horhschule in Germany as professor of hydrodynamics. He developed the well-known hydraulic machinery laboratory there. He was visiting professor at Massachusetts Institute of Technology from 1931-33.

He is well known for his accomplishments in the application of theoretical hydraulics to hydraulic machinery design.

He is the author of numerous research papers and of the well-known book, *Centrifugal Pumps, Turbines, and Propellors; Basic Theory and Characteristics.*

AMERICAN CHEMICAL SOCIETY

Meeting in Atlantic City Presents Largest, Most Diversified Program in ACS History

Chemists from all parts of the United States attended the 116th national meeting of the American Chemical Society September 19 to 23 in Atlantic City.

The largest, most diversified program in the society's history was presented, with 1,065 papers being given in 151 technical sessions.

The symposium on economic poisons which attracted widespread interest at the Spring meeting of the ACS was repeated. A symposium on "Flameproofing Textiles" was sponsored by the society's division of industrial and engineering chemistry.

Improvements in petroleum refining made possible by the relatively new adsorption technique were reported at a symposium sponsored by the petroleum division.

Recovery of gases, formerly wasted, by adsorption not only helps conserve natural resources but also provides additional revenue for the petroleum industry. The process, as applied by oil chemists, works, by placing tiny particles of certain solids, such as activated charcoal, in a chamber and then passing a stream of mixed gases through the chamber. The solids will pick out the particular gases sought, even though they are present in only minute amounts.

The importance of sulfur in agriculture was emphasized by the division of fertilizer chemistry, while "Protein Interactions" and "Mammalian Amino Acid Requirements" featured the symposium of the division of biological chemistry.

Recent discoveries pertaining to the importance of vitamin B12 in human and animal nutrition, advantages of titanium, and advancements in packaging and shipping of chemicals, were among topics discussed during the five-day meeting.

Ernest H. Volwiler, president-elect of the American Chemical Society, told the group of several products for the treatment of diseases which previously lacked any satisfactory chemotherapy.

Robert L. Dean, Rohm & Haas Co., Resinous Products Division, described for the chemists "a group of synthetic resins that bring about extraordinary chemical feats." Known as ion exchangers, these hard, granular materials are similar to the plastics used in telephones and the resins used in synthetic enamels —except that the ion exchange resins depend less on beauty and strength than on their ability to "swap" ions, or charged atoms, in solution.

"For ten years they have been performing silently but effectively as purifiers of the water used in thousands of industrial plants and homes," he said. "They have been used extensively in the chemical processing industries to remove acidic impurities from solutions, to isolate, concentrate, and purify valuable compounds."

Dr. Gustav Egloff, Universal Oil Products Company, and WSE president, told the group that the present trend of the chemical industry makes it doubtful that coal tar can be entirely relied upon as the source of aromatics for chemicals.

"In the past few years, requirements for aromatics have frequently been far in excess of supplies available from coal tar," he said. Despite a leveling-off period in our economy, many industries such as plastics and detergents are still growing and will require even greater quantities of aromatics.

"A number of developments underway are directed specifically toward commercial production of aromatics from petroleum," Dr. Egloff stated. One plant on the Gulf Coast will have a catalytic process in operation for converting gas oil into these products. In England, another plant is in operation which uses a catalytic process to make aromatics and olefinic gases from naphtha and gas oil.

"The extensive range of products includes benzene, toluene, eylenes, naphthalene, anthracene, phenanthrene, acenaphthene, chrysene, fluorene, and many others in commercial quantities," he said.

Petroleum derived xylene is a key factor not only in the alleviation of xylene shortages but also in cutting demands for naphthalene. The petroleum industry is now producing phthalic anhydride formerly made entirely from coal tar naphthalene. The new process utilizes orthoxylene as starting material. Phthalic anhydride is a critical substance in the production of many resins and plastics.

(*Continued on Page* 24)

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American Chemical Society Meeting

(*Continued from Page* 23)

Cresylic acids, present in many crude oils, can also be synthesized from toluene. At least one company is now constructing a plant for this purpose. The cresylic acids have a wide number of uses in plastics, textiles, medicinals, dyes, inks, disinfectants and ore flotation.

Heavy aromatic distillates from petroleum are used in the agricultural industry for selective weed-killing. Aromatics are also a necessary material for many synthetic detergents.

"In 1948, production of aromatics from petroleum was 892,000,000 pounds, which is about 40 per cent greater than the 1947 output," Dr. Egloff stated. "Toluene production reached 359,000,000 pounds and xylenes 383,000,000 pounds in 1948. This trend indicates a guarantee of a high level of aromatics production by the petroleum industry."

Marvin C. Rogers, director of research, R. R. Donnelley & Sons Co., told the ACS that while the manufacture of printing ink remains an art, the intense technical effort now being devoted to ink properties and to ink printing performance is beginning to show substantial results.

Mr. Rogers stated that the major ink suppliers, the National Printing Ink Institute, and several of the far-sighted printers all have technically trained personnel devoting their entire time to research and development of printing inks.

Their long-run goal, according to Rogers, is an ink with "the inconsistent properties of being non-drying in the supplier's can and on the printing press, and instantly-drying when contacted with paper during printing."

Linus Pauling, President of the American Chemical Society, told the group of current progress in industrial chemistry, some of it "the result of accidental discoveries," but much of it due to direct effort to improve processes and products by the use of a "penetrating understanding of the nature of the chemical substances involved."

"Precise knowledge about the structure of molecules and crystals has been available only during the last few years, the first determination of interatomic distances having been around 1920, and most of the work in this field having been done since 1930," he stated.

"These investigations," he said, "including the analysis of spectra and of the diffraction patterns produced by x-rays and electron beams . . . are useful not only for determining the atomic structure of substances, but also for chemical analysis. One of the most useful instruments is an automatic infrared spectro-photometer."

"An interesting example of the usefulness of modern physical chemical methods was provided by the penicillin program during the war," Pauling said. "The manner in which the atoms are bound together to form the penicillin molecule was not discovered by the usual methods of organic chemistry, despite the attention of many outstanding organic chemists, but was discovered by the use of infrared spectroscopy and x-ray diffraction. These methods have been used also in connection with some of the other newly discovered antibiotics."

The valuable use made of the knowledge obtained by the methods of physical chemistry is illustrated also by the fields of synthetic fibers, synthetic rubber, and synthetic plastics, according to Pauling. Our knowledge of the structure of natural fibers, obtained largely by x-ray studies, pointed the way for the synthesis of nylon, which has been found to be superior to natural fibers for many purposes.

Similarly, a knowledge of the structure of natural rubber indicated what sort of chemical substances should be prepared and investigated as promising synthetic rubbers, and similar considerations have been valuable in the development of plastics.

Citing the need for a considerable increase in basic research in molecular structure, he warned that such an increase will be possible only if there is an increase in the number of well-trained chemists produced by our universities. "The number of Ph.D's in chemistry last year, approximately 1,000, is twice as great as the number ten years before, which itself represented a doubling from the preceding decade," he stated.

F. H. McIntyre, vice president and director of research of the Ferro Enamel Corp., described for the chemists the colorants used for plastics, including dyes, organic pigments, and pearlescent materials. "The choice of colorant depends on many variables, not the least of which is cost," he said. The hue, degree of transparency desired, type of plastic resin, and durability all must be considered.

"Durability of the plastic in form and color is becoming of greater importance," he said. This can be controlled to some extent, according to Mr. McIntyre, by incorporating stabilizers in the batch at the time the article is molded, but the trend, for reasons of durability, is definitely toward the inorganic pigments at the expense of the organic dyes and lakes. "The inorganic pigments, unlike the others, are generally unaffected by aging, sunlight, oxidation or heat," he said.

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Industrial Research

(*Continued from Page* 6)

There is also a zone of common intensity of interest between research and sales and this may be termed sales development. It is in this zone that both sales and research should work together to develop markets for new products, and new markets for existing products. Since this is called sales development it would probably be more logical to speak of development as related to manufacturing, as "production development." As to the details of the ideal relationship between research and production, it should operate in the following manner.

Let it be assumed that a new process has been developed in the central research laboratory, its patent position found to be satisfactory, and market research completed to the point where it appears that if pilot plant work gives satisfactory results, a business enterprise can be established. At this point the engineer in charge of the development group from that producing plant expecting to handle the process, should be brought to the central research laboratory. He should, of course, have with him as many of his group as may be needed. The corporation engineering division should also be represented. The process should then be set up and demonstrated in the applied research or chemical engineering laboratory. During the time when those small scale tests are being run, plans should be completed for large scale pilot plant tests, needed equipment designed and ordered. This, of course, should be the responsibility of the production division development engineer.

Finally, the flow sheet should be put together in the pilot plant located at the production plant and the tests completed under the responsibility of the production manager but with consultation and help of the corporate research division men as needed.

In other words, the responsibility for the work on a new process resides first in research, then gradually shades into the zone of common interest between research and production and then passes finally to production.

Production development has another function at operating plants. This is its responsibility for what may be termed "process and equipment maintenance." This includes a planned program for studying methods of maintaining and improving operating process efficiency and the equipment itself. In order to satisfactorily carry out this function, it is usually best to have a pilot plant which is capable of exactly duplicating the process in use in the producing plant. The equipment should be so arranged, however, that changes in the flow sheet may be made easily. Such a pilot plant can usually be profitably kept in continuous operation, making studies on the maintenance of process efficiencies, improvements in the process and the equipment being used.

Since the head of the department of applied research of the research division is on the same organizational level as the production manager of the producing division, liaison by means of visits and correspondence does not present a difficult problem. An analogous situation and method for handling it is found between research and sales development.

What About Expenditures?

Research Expenditures. There is no universal yardstick for the size of research expenditures. The amount which should be spent depends on the needs of the business, the taxes paid, the policy set for business expansion, etc. An average figure for most of the larger concerns runs as low as one per cent and as high as five per cent of the dollar value of total sales.

What is *more* important is that whatever be the sum decided upon, it be sustained over a reasonable period of years. For this reason amounts allocated for research are customarily based on per cent of sales rather than on per cent of profits. *The best method of financing research is to establish a reserve fund which is built up by a certain amount of money per unit of each product manufactured.* This reserve should be drawn upon as needed for research expenditures, leaving in the reserve the unused amount. This permits the acceleration of research when any part of the business is not at its best, which is the time when research is most needed.

Properly handled, research is always self-supporting, but since corporation profits and business progress are due to many factors of which research is only one, it is always quite difficult to prove to the satisfaction of all concerned that research has had any part whatever in the business gains. When the patient is well and every indication points to a vigorous longevity, the need for doctors is not apparent. But the preventive medicine of research is as important to any business as preventive medicine is to human life.

In certain cases, it is possible to operate a research division on a straight profit-and-loss basis. This is best done by means of the payment of royalties or fees to the research account for work performed and discoveries made. This method is not quite as clear cut nor as satisfactory for the business as a whole as the setting up of the research reserve mentioned previously, but it can be made to work.

In summary. The place of research in the corporation is as an equal partner in management with production and sales. These three pillars support and insure the success and future of the organization. Each group has its own special problems and methods, but all unite in the same major objective, the development and maintenance of a successful business enterprise.

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New Electronic Equipment Described at Conference

An instrument which will detect variations as small as one-millionth of an inch in the thickness of sheets of nonmagnetic materials was described by Irving W. Rozian and Stephen V. Hart, Industrial Electronics, Inc., at a meeting of the National Electronics Conference at the Edgewater Beach Hotel, September 26.

Rozian said the instrument already has been used to measure the thickness of sheets of plate glass as they leave the manufacturing rolls. Extremely minute variations in the thickness of the glass or other measured material are directly recorded on the dial of a meter or continuously recorded.

Under operating conditions a sheet of the measured material passes through the measuring head. As long as thickness is standard the dial of the meter will indicate zero. If thickness increases or decreases the meter will show upscale or downscale indications. This permits direct control of manufacturing rolls in such a fashion as to maintain constant thickness.

Although electronic thickness testers are not new, Rozian and Hart say the new tester employs a new principle. The thickness gage they describe is based on the variation of the inductance coupling of two coils separated by the material which is to be measured. They say the advantage of this method is its independence of dielectric or optical properties of the measured material and of its moisture content.

Another conference speaker described airborne radar equipment which can be used to make contour maps of the earth's surface faster and less expensively than ever before.

Richard C. Raymond, Haller, Raymond and Brown, Inc., State College, Pa., told the conference that electronic contour mapping would make contour maps "at a speed heretofore unparallel."

"This high speed mapping would reduce the cost of contour maps to such an extent that maps of many of the present unmapped regions of the world could be made at reasonable cost," he predicted.

An airborne radar set, Raymond explained, can observe several thousand points per second on the ground and convert its measurements into effective ground measurements of position and elevation of each ground element in a manner similar to surveying.

The system then produces a map on which the elevation data may be produced in terms of ordinary contour lines, varying shades of gray, or various colors.

"Although not yet put into operation," Raymond said, "calculations show that an advanced model, operating in an airplane at high altitude, could produce maps at a rate of 1,000 square miles per flying hour."

HORTON ELEVATED TANK at Whitefish Bay

The pressure in the water system at Whitefish Bay, Wis., is definitely improved since the city installed a 1,000,000-gal. elevated tank in its water system.

Whitefish Bay is another of the progressive cities that have installed elevated tanks to obtain the benefits of gravity water pressure. This trend is continuing because elevated storage generally offers: (1) uniform water pressure during peak loads, (2) adequate reserve supply during power failure, (3) lower pumping costs, (4) increased capacity of water system, (5) lower fire insurance rates.

The radial cone-bottom design of tank, as shown at the left, is particularly well adapted to large capacities. It provides a lower range in head for comparable capacities than tanks of smaller diameter. Hence, the pumps are working against a lower average head, which reduces pumping costs.

Horton welded steel tanks are available with radial-cone bottoms in capacities from 500,000 to 2,500,000 gals. and with ellipsoidal bottoms from 15,000 to 500,000 gals. Write our nearest office for complete details.

Left: 1,000,000-*gal. Horton radial-cone bottom tank recently erected at Whitefish Bay, Wis.*

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Heating, Ventilating Engineers To Meet

Plans for an active season, featuring regular monthly meetings, are now being developed by the Illinois Chapter of the American Society of Heating and Ventilating Engineers.

Joseph S. Kearney, president, Northwestern Heating & Plumbing Co., Evanston, is chapter president for 1949-50.

Eight meetings will be held the second Monday of each month at the Merchants and Manufacturers Club, Merchandise Mart. The first meeting, on October 10, will feature a talk on maintenance and servicing of heating systems and equipment.

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THE WESTERN SOCIETY OF ENGINEERS

AIEE to Meet in Cincinnati

The 1949 Fall General Meeting of the American Institute of Electrical Engineers will be held in Cincinnati, Ohio from October 17 to 21.

Five technical groups of the Institute, Communications, Industry, Science and Electronics, General Applications, and Power, will sponsor sessions. The program will include, in addition, inspection trips, and a special women's program, as well as social events.

Technical sessions on Monday, October 17, will cover rotating machinery, probability methods, industrial power systems, speed governing, instruments and measurements, and undervoltage protection of motorized devices.

Tuesday's sessions will cover system economics, industrial control, problem and thesis subjects from industry, and a second session on rotating machinery.

Sessions on Wednesday, October 19, will include a conference on railroad communication, one on applications of conformal mapping in electric circuit analysis, and further sessions on rotating machinery and protective devices, voltage induction, coaxial television and telephone systems, aluminum in the electrical industry.

Thursday, October 20, will feature sessions on transmission and distribution, mining and metal industry, radio, machine tools, and television. Friday's sessions will cover relays, conductors and accessories, electronic power converters, substations, and further conferences on machine tols.

Inspection trips will be made to the Baldwin Company (pianos and organs), Procter and Gamble, Fisher Body Plant, Miami Fort Generating Station, Oakley Colony (center of machine tool production), Crosley Broadcasting Corp., and an inspection trip and forum sponsored by the Engineering Society of Cincinnati.

Registration information may be obtained from D. T. Michael, Chairman Registration Committee, Fall General Meeting AIEE, Cincinnati Gas & Electric Co., 323 Plum St., Cincinnati 2, Ohio.

Illuminating Society Plans Panel Oct. 7

Highlights of the recent National Technical Conference of the Illuminating Engineering Society will be the subject of a panel discussion at a meeting of the Chicago Section at 7:30 p.m., October 7, at the Chicago Lighting Institute, 37 S. Wabash Avenue.

G. K. Hardacre, Manager of Commercial Sales, Public Service Company of Northern Illinois, who is a past president of the Society will act as moderator and will discuss the business and social events of the conference. The technical phases will be described by R. J. Diefenthaler, District Engineer, General Electric Company and Carl F. Jensen, District Engineer, Westinghouse Electric Corporation.

The regular meeting will be preceded at 6:15 p.m. by a meeting of the Study Club. The subject will be "A Technical Discussion of the Physical Characteristics of the Slimline Lamp and Its Accessories." Both meetings are open to the public.

Director of Armour Research Foundation Speaks to Optimists

The future of industry depends on scientific research, Dr. Haldon A. Leedy, director of Armour Research Foundation of Illinois Institute of Technology, told members of the Optimists Club recently.

"Our success as an industrial nation will depend upon our ability to develop new machines, new processes, and new products which are better than those we now have," Dr. Leedy declared.

"Scientific achievement is a dynamic, not a static, affair. We must run fast to stay where we are; to move ahead we must run still faster," he said.

Pointing out that most of the largest industries in the United States have been an outgrowth of technological developments, Dr. Leedy cited the chemical, steel, electrical, and the transportation industries.

"If these industrial organizations are to continue to maintain their positions in our competitive free enterprise system, they must continue to improve their products or services through further development and research," Dr. Leedy said. "Never before has any nation been so completely built around scientific and engineering developments, and never before has a nation been so completely dependent on scientific advances."

Very few industries can afford the costly staff and equipment necessary to solve complex research problems, Dr. Leedy stated, and many firms—even the largest—have turned to outside research organizations.

Dr. Leedy described ten possible objectives of a well organized research program:

1. Anticipate troubles, 2. Cure existing troubles, 3. Reduce product cost, 4. Increase product utility (modify or find new uses), 5. Reduce consumer's operating or maintenance cost.

6. Develop new processes, materials, or products, 7. Improve quality of existing materials or products, 8. Bring about better standardization, 9. Amass technical information for better understanding of a product, 10. Contribute to general technical knowledge, the ultimate motive being increased markets through higher standards of living.

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WSE Applications

In accordance with the By-laws of the Western Society of Engineers, the following names of applicants are being submitted to the Admissions committee for examination as to their qualifications for admission to membership into the Society in the various grades, i.e., Student, Junior, Member, Associate, etc. All applicants must meet the highest standards of character and professionalism in order to qualify for admission, and each member of the Society should be alert to his responsibility to assist the Admissions committee in establishing that these standards are met. Any member of the Society, therefore, who has information relative to the qualifications or fitness of any of the applicants listed below, should inform the Secretary's office, 84 E. Randolph St., RA ndolph 6—1736.

Applicants after June 1, 1949:

23-81 Howard E. Post, Mass Spectrometer Dept., Physics Div., Universal Oil Products Co., Riverside, Ill.

24-81 Willis A. Naudain (Rein.), Secretary, Southern College of Commerce, 302½ Houston St., Fort Worth, Texas.

25-81 George E. Shelton, Construction Engineer, Universal Oil Products Co., 310 S. Michigan Ave.

26-81 Benjamin S. Benson, Jr., Illuminating Engineer, Benjamin Electric Manufacturing Co., Des Plaines, Ill.

27-81 Robert J. Mors, Field Engineer & District Repr., Benjamin Electric Manufacturing Co., 20 N. Wacker Dr.

28-81 Hoyt P. Steele, Executive Vice President, Benjamin Electric Manufacturing Co., Des Plaines, Ill.

29-81 Arthur E. Swedenborg, Division Sales Manager, Benjamin Electric Manufacturing Co., 20 N. Wacker Dr.

30-81 Harry J. Kraig, 1608 S. 51st Ave., Cicero—attending Illinois Institute of Technology.

31-81 C. McA. Evans, President, Chicago Steel Foundry Co., 3720 S. Kedzie Ave.

32-81 Andrew R. LeBailly (Rein.), Mechanical Engineer & Partner, Sargent and Lundy, 140 S. Dearborn St.

33-81 Paul B. Simons, Sales Representative, Bell Lumber & Pole Co., Minneapolis, Minn.

34-81 Frank V. Smith, Chief Electrical Engineer, Sargent and Lundy, 140 S. Dearborn St.

35-81 Lorraine A. Rumsey, Engineering Clerk-Special, Illinois Bell Telephone Co., 208 W. Washington St.

36-81 Roy C. Young, Manufacturers Representative, 333 N. Michigan Ave.

37-81 Harold F. Buchanan, Sales Engineer, General Electric Co., 840 S. Canal St.

38-81 Lloyd C. Spake, Sales Engineer, Allis-Chalmers Manufacturing Co., 135 S. LaSalle St.

39-81 John E. Winslow, General Supervisor, Oxweld Railroad Service Co., 230 N. Michigan Ave.

40-81 Harry E. Noren (Rein.), Assistant Engineer of Tests, Public Service Company of Northern Illinois, 1319 S. First Ave., Maywood, Ill.

41-81 Charles E. Bobus, Chief Engineer, Charles E. Crone Company, 1656 N. Ogden Ave.

42-81 Don E. Inman, Northwestern Dist. Engineer & Service Mgr., Westinghouse Electric Corp., 20 N. Wacker Dr.

43-81 Barry M. Kostenko (Trsf.), Civil Engineer & Office Mgr., Sueske Brass & Copper Co., 13 N. Peoria St.

44-81 Edward Allen, Midwestern Editor-Electrical World, McGraw-Hill Co., 520 N. Michigan Ave.

45-81 Warren H. Brandt, Draftsman; DeLeuw, Cather & Co., 150 N. Wacker Dr.

46-81 Merwyn C. Kimberly, Staff Engineer, Commonwealth Edison Co., 72 W. Adams St.

47-81 William R. McConochie, Section Chief; DeLeuw, Cather & Co., 150 N. Wacker Dr.

48-81 Lee Schlesinger (Trsf.), Grad. Assistant, Soil Mech., Illinois Institute of Technology, 3300 Federal St.

49-81 J. Fred Stoliker, President & Director of Research, Delta Engineering Co., 75 E. Wacker Dr.

50-81 Miss Patricia M. Young; Eng. Assistant, Chief Eng. Office, Illinois Bell Telephone Co., 208 W. Washington St.

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51-81 Nels J. Hansen, Service & Sales Engineer, Moloney Electric Co., 100 W. Monroe St.

52-81 Donald J. Bergman, Chief Engineer, Universal Oil Products Co., 310 S. Michigan Ave.

53-81 M. C. Waterman, President, Frabimor, Epuipment & Controls Co., Inc., 800 N. Clark St.

54-81 J. J. Clancy; Assistant Manager, Tar Products Div., Koppers Co., Inc., 122 S. Michigan Ave.

55-81 J. Earl Harrington (Rein.), Executive Secretary, Western Society of Engineers, 84 E. Randolph St.

56-81 Ronald C. Ailara, Assistant Engineer, Commonwealth Edison Company, 2233 S. Throop St.

57-81 Frank V. Carroll, Consulting Engineer, Inland Steel Co., 38 S. Dearborn St.

58-81 George E. Draznik, Engineer, Illinois Bell Telephone Co., 208 W. Washington St.

59-81 Charles F. Lukes, 5217 Melrose St., attending Illinois Institute of Technology.

60-81 Ganji G. Tanaka, Sewer Draftsman, Bureau of Sewers, City of Chicago, 188 W. Randolph St.

61-81 H. Bowen Stair, Assistant Vice President, Illinois Bell Telephone Co., 212 W. Washington St.

62-81 Thomas F. Deegan, Assistant Engineer, Illinois Bell Telephone Co., 212 W. Washington St.

63-81 Raymond C. Stepka, Draftsman, Public Service Company of Northern Illinois, 72 W. Adams St.

64-81 Chas. P. Knowe, Partner, Peter Knowe & Son, 6655 N. Avondale Ave.

65-81 Clyde H. Schrotberger, Division Vice Pres. Represent., Public Service Company of Northern Illinois, 159th & Fisk, Harvey, Ill.

66-81 Frank J. Novak, Sales Engineer, The Yale & Towne Mfg. Co., 815 N. LaSalle St.

67-81 William H. Reynolds, Engineer, Battey & Childs, 231 S. LaSalle St.

68-81 Charles F. McCann, Engineer, Illinois Bell Telephone Co., 212 W. Washington St.

69-81 Harlan H. Davis, District Manager, Plastic & Rubber Prod., Inc., 400 W. Madison St.

70-81 Gordon F. Spooner, Chicago Sales Manager, General Blower Co., 8600 Ferris, Morton Grove, Ill.

71-81 Patrick S. Hardy, Structural Draftsman, Ralph H. Burke, 20 N. Wacker Dr.

72-81 V. O. Bernthal, Division Operating Supt., Public Service Company of Northern Illinois, Box 278, Glencoe, Ill.

73-81 Juel T. Chapman, Chemical Engineer, Universal Oil Products Co., 310 S. Michigan Ave.

74-81 Walter A. Anderson, Draftsman, Ralph H. Burke, 20 N. Wacker Dr.

75-81 Curt C. Clement, Electrical Engineer, Ralph H. Burke, 20 N. Wacker Dr.

76-81 Charles J. DeLoach, Designer, Ralph H. Burke, 20 N. Wacker Dr.

77-81 S. W. Lewaren, Structural Engineer, Ralph H. Burke, Bensenville, Ill.

78-81 Vincent Viscariello, Arch. Sec. Head, Ralph H. Burke, Bryn Mawr & Wolf Rd., Bensenville, Ill.

79-81 Jerome B. Wolff, Hydraulic Engineer, Ralph H. Burke, 20 N. Wacker Dr.

80-81 Harold A. Saxer, Estimator, A. C. Skon Co., 670 N. Carpenter St.

81-81 Orval Allison, Engineer, Illinois Bell Telephone Co., 212 W. Washington St.

82-81 Ralph H. Halvorsen (Trsf.), Dev. & Research Engineer, Teletype Corp., 1400 W. Wrightwood Ave.

83-81 Richard E. Marr, Engineer, Lever Brothers Company, Hammond, Ind.

84-81 Robert E. Peyton, Design Draftsman, A. J. Boynton & Co., 109 N. Wabash Ave.

85-81 Robert L. Peterson, Structural Engineer, City of Chicago, Dept. of Public Works, 139 N. Clark St.

86-81 George F. Boesen, Television Engineer, WBKB Television Station, 190 N. State St.

87-81 Sidney Epstein, Officer of Corp., A. Epstein and Sons, Inc., 2011 W. Pershing Rd.

88-81 Charles J. Siska, Jr., Structural Steel Draftsman; DeLeuw, Cather & Co., 150 N. Wacker Dr.

89-81 Donald F. Bacher, Engineer Draftsman, Ralph H. Burke, RFD #2, Bensenville, Ill.

90-81 William J. Mahaffey; Section Head, Mechanical Div., R. H. Burke, 20 N. Wacker Dr.

91-81 Eugene R. Russell, Engineering Assistant, Ralph H. Burke, RR #2, Bensenville, Ill.

92-81 Charles G. Seynemeier, Ralph H. Burke, RR #2, Bensenville, Ill.

93-81 Leonard M. Hoffman (Trsf.), Factory Contact Engineer, General Electric Co., Erie, Penn.

94-81 Edward J. Doyle, Engineer, Illinois Bell Telephone Co., 208 W. Washington St.

95-81 Harry R. Hartman, Chief Engineer, Witco Chemical Co., 6200 W. 51st St.

96-81 Irving E. Boberg, Chief Engineer, Chicago Bridge & Iron Co., 1305 W. 105th St.

97-81 Allen K. Hamilton, Partner, Cyrus G. Hill, 231 S. LaSalle St.

98-81 John M. Lindstrom (Rein.), Structural Designer, Pure Oil Co., 35 E. Wacker Dr.

99-81 Wilfred C. Burdick, Project or Field Engineer, A. L. Jackson Co., 161 E. Erie St.

100-81 Frank J. Heidenreich, Jr.; Chief, Planning, A. L. Jackson Company, Inc., 161 E. Erie St.

101-81 Kurt S. Tannenwald, Checker, The Babcock & Wilcox Co., 5 So. Wabash Ave.

102-81 Carl S. Vercoe, Sales Engineer, Link-Belt Company, 2410 W. 18th St.

103-81 Robert J. Durkin, 936 W. 76th St.

104-81 Einar G. Magnuson, Mechanical Engineer, Sargent & Lundy, 140 S. Dearborn St.

105-81 Donald A. Walsh, 8249 Newland St., attending Illinois Institute of Technology.

New Members who applied prior to June 1, 1949:

242-80 Earl H. Pratscher, Structural Designer, Freyn Engineering Co., 109 N. Wabash Ave.

355-80 Mark J. Hess, Asst. Chief Engr., Wilson & Co., Inc., 4100 S. Ashland Ave.

357-80 Ralph E. Lilleberg, President, The Flexan Corp., 3949 N. Normandy Ave.

358-80 Wm. G. Hinckley, Dist. Sales Mgr., Westinghouse Electric Corp., Elevator Div., 506 N. Dearborn St.

359-80 Norman H. Schick, Sales Representative & Supt. of Repro. Dept., Frederick Post Co., 155 E. Ohio St.

360-80 Charles H. Edmondson, Mech. Engr.-Ref. Tech. Dept., Pure Oil Co., 35 E. Wacker Drive.

361-80 Michael C. Todd; Designer, Checker, A. J. Boynton & Co., 108 N. Wabash Ave.

363-80 Fred Stocek, Vice President, Hoffman Electric Co., 2525 W. Van Buren St.

364-80 Paul C. Kreuch, Dist. Mgr., Rockwell Mfg. Co., 122 S. Michigan Ave.

368-80 George P. Schleicher, Engr., Illinois Bell Telephone Co., 208 W. Washington St.

370-80 Alden T. Wulff, Assis. Engr., Public Service Company of Northern Illinois, 3301-3359 Oakton St., Skokie, Illinois.

371-80 A. C. McWilliams, Contractor, McWilliams Electric Co., 109 N. Wabash Ave.

374-80 Thomas M. Niles (Rein.), Partner, Greeley and Hansen, 220 S. State St.

376-80 William D. Futrell (Trsf.), Equipment Engineer, Western Electric Co., Hawthorne Station.

377-80 R. I. Parker (Rein.), Commercial Vice President, General Electric Co., 840 S. Canal St.

378-80 Gerald E. Riepe, Manager-Chicago Office, Builders Iron Foundry, 122 S. Michigan Ave.

379-80 Robert W. Layer, Jr., Associate Architect, Robert W. Layer, Architect-Engineer, 189 W. Madison St.

381-80 John E. Starrett, Partner-Structural Engineer, Perkins & Will, 309 W. Jackson Blvd.

382-80 Thomas R. Byrnes, 7819 S. Hermitage Ave., attending Illinois Institute of Technology.

384-80 Charles K. Lambka, Manager, Lamp & Lighting Dept., Electric Supply Corp., 701 W. Jackson Blvd.

385-80 Fred B. Smith, Service Manager, Montgomery Elevator Co., 329 S. Wood St.

372-80 Roland B. Butterfield, General Plant Supervisor, Illinois Bell Telephone Co., 212 W. Washington St.

New Members who applied after June 1, 1949:

4-81 Charles F. Schar, Supt. Fire Prevention-Safety, University of Illinois, Chicago 721 S. Wood Street.

5-81 Harold E. Church, in charge of laboratory, Benjamin Electric Manufacturing Co., Des Plaines, Ill.

11-81 Edmund J. Valonis (Trsf.), Engineer Trainee, Inland Steel Co., Indiana Harbor, Ind.

13-81 James E. Dare, District Gas Supt., Public Service Company of Northern Illinois, Blue Island, Ill.

14-81 Ervin B. Kodat, Mechanical Draftsman, H. P. Smith Paper Co., 5001 W. 66th St.

17-81 David J. Fischer, Owner, David Architectural Iron Works, 2019 Walnut St.

19-81 John C. Raaen, General Manager Research & Develop. Labs., Universal Oil Products Co., Drawer C, Riverside, Ill.

20-81 Donald E. Ennis, Sales Engineer, Powers Regulator Company, 3821 N. Ashland Ave.

22-81 Frank A. Miller, Manager, J. L. Simmons Company, Inc., 185 N. Wabash Ave.

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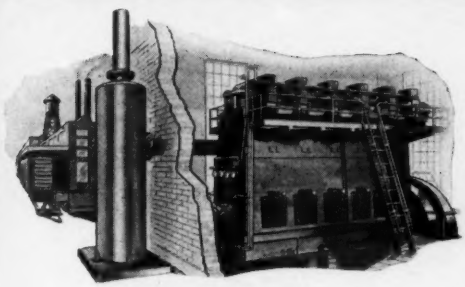
corrosion-proof

Vitrified salt-glazed clay pipe never needs a protective coating. It cannot be weakened or roughened by rust. Electrolysis cannot pit it. Clay pipe is immune to any form of chemical attack. It stays strong and smooth—superbly resistant to *all* the enemies of sewer pipe.

When you choose sewer pipe, *demand a guarantee.* Clay Products Association members offer you a *written guarantee* against the corrosion of clay pipe. Investigate.

CLAY PRODUCTS ASSOCIATION
100 North LaSalle Street, Chicago 2, Illinois



SNUB THE SLUG and STOP THE NOISE

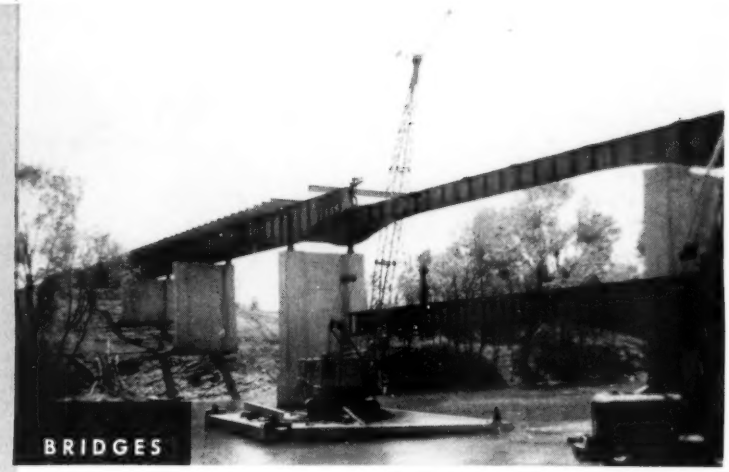
Noise from engines, compressors, blowers, and vacuum pumps can be prevented by using Burgess-Manning Snubbers. The Snubber prevents noise by smoothing the intake air and dissipating the energy in the exhaust gas slugs, providing quiet operation without affecting performance.

The Burgess-Manning line consists of air intake and exhaust Snubbers and Combination Air Intake Cleaner-Snubbers for use on internal combustion engines, compressors, blowers, and vacuum pumps. For solution of your noise problems, consult the Burgess-Manning Engineers.

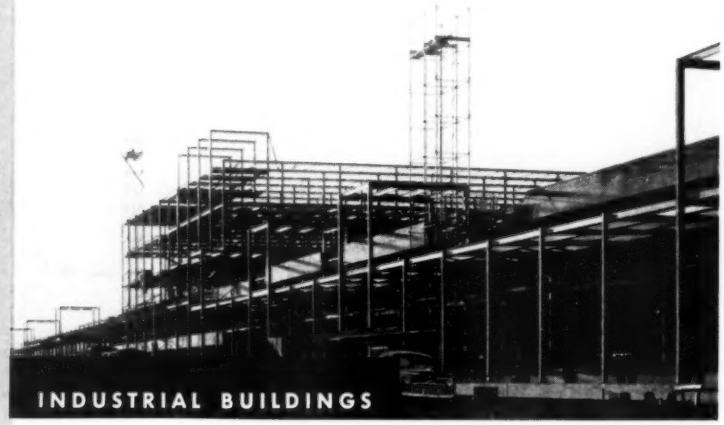
BURGESS-MANNING COMPANY
749-W East Park Avenue, Libertyville, Illinois

Fabricators and Erectors of *Structural Steel*

• Statistics show the steel industry has facilities to fabricate and erect over two million tons of steel in 1949. America finds Allied ready with *three* fully equipped plants, operating under unified control, with abundant capacity to tackle a big share of the job. Here expert crews fabricate and erect bridges and buildings from the blueprint stage to finished structures. We invite you to consult Allied on any structural job that's pending . . . large or small. Send us your specifications for estimates.



Allied engineers adapt methods to the job, often employing water erection with floating equipment to shorten bridge-building hours.



Similar equipment in each of Allied's three plants speeded up fabrication of structurals for this giant industrial plant.

3250 Tons of steel were fabricated by Allied for this California highway bridge . . . erected according to Allied's precision method.